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ECONOMICS OF SHIP CONSTRUCTION

By

YU. YE. KROTOV

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ANNOTATION

[Excerpts] This text contains a complete exposition of all problems in the economics, organization, and planning of ship-building production examined in the curriculum of a ship-building tekhnikum, namely: principles of the economics, organization, and planning of ship-building production; the organization and economics of the technical preparation and technical control of production in ship-building; the organization and planning of auxiliary operations in a ship-building plant; the planning of records and analysis of the production-economic activity of a ship-building plant and its subdivisions.

The text is intended for students in ship-building tekhnikums, in these specialties: Ships'Hull Construction, and Ships' Machinery and Mechanisms. It can be used by engineering-technical personnel in the ship-building industry as well as everyone engaged in the independent study of economic problems of ship-building production.

CHAPTER 4. FIXED AND CIRCULATING CAPITAL OF A SHIP-BUILDING PLANT

Section 15. Fixed Capital and Its Structure

The concept of fixed capital. In the production process, workers process the objects of labor using the means of labor: machinery, mechanisms, power equipment, tools, and so on. The means of labor also include plant buildings, structures, building slips, fitting-out piers, and so on, which provide appropriate conditions for production work. The means of labor, figured in monetary terms, are called the fixed productive capital.

Fixed productive capital is in operation for many years---that is, it participates repeatedly in the production process. For example, building slips are in operation for decades, used for launching dozens and hundreds of ships. But fixed capital does wear out, and as it does its value, by portions, is converted into the value of manufactured items.

Every enterprise also has fixed nonproductive capital, which includes non-productive facilities: housing, houses of culture, and so on.

The structure of fixed productive capital in a ship-building plant. The concept of fixed productive capital should comprise its make-up by groups and the proportion of each group in the total value of it.

Table 1 shows the structure of fixed productive capital of ship-building plants, and for comparison, data on machine-building.

(1) № группы	(2) Группа	(3) Краткий состав группы	Удельное значение (4) (доля), %	
			в судостроении (5)	в машиностроении (6)
I.	(7) Здания	(15) Производственные корпуса, конторы, склады	31	41
II	Сооружения (8)	(16) Стапеля, слипы, доки, дамбы, очистные сооружения, железнодорожные пути, автодороги	34	13
III	(9) Передаточные устройства	(17) Электросети, теплотсети, паропроводы, водопроводы		
IV (10)	Машины и оборудование	(18) турбины, паровые котлы, электросварочные аппараты, измерительные и регулирующие приборы, вычислительная техника	28	41
V (11)	Транспортные средства	(19) Автомобили, электрокары, электровозы, буксиры, катера	5	2
VI (12)	Инструмент	(20) Инструмент стоимостью более 50 руб., находящийся в эксплуатации более 1 года	1	2
VII (13)	Производственный инвентарь и принадлежности	(21) Рабочие столы, верстаки, инвентарная тара	1	1
VIII (14)	Хозяйственный инвентарь	(22) Шкафы, столы, пишущие машинки, множительные аппараты		
(23)	Итого . . .		100	100

Table 1. Structure of Fixed Productive Capital

[Key on following page]

Key:

1. Group No
2. Group
3. Brief make-up of group
4. Proportion (share), percent
5. Ship-building
6. Machine-building
7. Buildings
8. Structures
9. Transmission facilities
10. Machinery and equipment
11. Transport devices
12. Tools
13. Production stock and accessories
14. Business furnishings
15. Production buildings, offices, warehouses
16. Building slips, slipways, docks, dikes, cleaning facilities, railroad tracks, roads
17. Electricity lines, heating lines, steam lines, water lines
18. Turbines, steam boilers, electric welding equipment, measurement and regulating instruments, computers
19. Trucks, electric trucks, electric locomotives, tugs, power boats
20. Tools more than 50 rubles in value used more than one year
21. Desks, workbenches, packaging and crating
22. Closets, desks, typewriters, duplicating equipment
23. Total

The most actively and directly participating in the production process are the means of labor groups 4 through 6, which include power and manual machinery and equipment, measurement and regulating instruments, transport, and tools. These are known as the active portion of fixed productive capital, and their proportion increases as technical progress advances.

One characteristic of fixed productive capital in the ship-building industry is the relatively large share of structures involving such costly facilities as building slips, fitting-out piers, and docks.

Section 16. Methods of Evaluation, Records, and Planning of Fixed Capital

Methods of evaluation and records. Fixed capital is evaluated and kept track of in both physical and monetary terms. The physical evaluation of fixed capital (in units and sets) is necessary in order to represent it in terms of physical make-up, also to calculate the productive capacity of the plant, the operation of the capital, the organization of repairs and replacement of worn out equipment.

Overall planning and records of fixed plant capital as a whole are handled only in monetary terms. There are three methods of monetary evaluation of fixed capital: in terms of initial value; in terms of replacement value--that is, the value of the fixed capital with respect to current conditions of manufacturing it; and in terms of initial value less wear. Of greatest practical use is the evaluation of fixed capital in terms of initial value--that is, without regard to wear. The initial value is used to plan the overall value of the fixed capital and a number of indicators which characterize the extent of its use.

Average annual value of fixed capital. Fixed capital does not remain unchanged in the course of a year: a portion of it is removed from production, new facilities are put into production, some are technically retooled (modernized). As a result, the overall value of fixed capital changes constantly. In connection with this, of great importance to the planning of the value of fixed capital is the average annual value.

The average annual value of fixed capital is established by means of rather complicated calculation, which takes account of the specific timing of the removal and introduction of facilities in the course of a year. The average annual value is determined by dividing by 12 half of the total fixed capital on hand as of 1 January of the planning year and anticipated as of 1 January of the following year, also the total fixed capital planned as of the first day of the remaining months of the year, taking account of the capital which is put into production and that which is removed.

For example, if the initial value of the fixed capital in a shop as of 1 January 1971 was 2.5 million rubles; and if new capital is to be introduced during the year as follows: 140,000 rubles worth in April and 100,000 rubles in August; and if facilities worth 30,000 rubles are to be written off (10,000 in May and 20,000 in October), the the average annual value of the shop's fixed capital is determined as follows:

1) determine the value of the fixed capital as of the first of each month; it will be:

2.5 million rubles as of 1 January, February, March and April;

2.64 million as of 1 May, since 140,000 rubles worth will be introduced in April;

2.63 million as of 1 June, July, and August, since 10,000 rubles worth will be removed in May;

2.73 million as of 1 September and October, since 100,000 rubles worth will be introduced in August;

2.71 million as of 1 November and December 1971 and 1 January 1972. since 20,000 worth will be removed in October;

2) on the basis of these data, in accordance with the method described we determine the average annual value of the shop's fixed capital for 1971 (in thousands of rubles):

$$\frac{2500 \cdot 0,5 + 2500 + 2500 + 2500 + 2640 + 2630 + 2630 + 2630 + 2730 + 2730 + 2710 + 2710 + 2710 \cdot 0,5}{12} =$$

= 2626.2 thousand rubles.

In long-term planning as well as for one year, in case accurate data on the timing of the introduction and removal of fixed capital are lacking, the average annual value of fixed productive capital is determined by a simplified method--that of adding to the value of the fixed capital as of the first of the year 35 percent of the value of the introduced capital and subtracting 35 percent of the value of the removed capital. For the example given above this will be:

$$2500 + 240 \cdot 0,35 - 30 \cdot 0,35 = 2573,5 \text{ thousand rubles.}$$

Indicators of effectiveness of use of fixed productive capital. Production output increase can be achieved in two ways:

- 1) by expanding the production area, installing additional equipment, and hiring more personnel (the extensive way);
- 2) without expanding the area or increasing the amount of equipment, by hiring more personnel and organizing the work into two shifts; or with the same number of personnel, providing for better utilization of equipment by reducing the amount of idle time, using increased operating conditions, and other factors (the intensive way).

The first way is not economically suitable, because it requires considerable state funds. The second way makes it possible to get the same increase in output while saving considerable funds that can be channeled by the state into enhancing the material wellbeing of the workers and other goals.

In planning the introduction of new fixed capital and in evaluating the activity of the shop and the plant it is imperative that account be taken of the degree to which available capital is being utilized. For these purposes, use is made chiefly of three indicators: the output-capital ratio, the equipment utilization coefficient, and the shift index.

The output-capital ratio indicator represents the amount of product turned out, on the average, per ruble of fixed productive capital in the

shop or plant. It is determined as follows:

$$O_f = \frac{P}{F} \quad (8)$$

where f is the output-capital ration, rubles;
 P is the production volume, rubles;
 F is the average annual value of fixed productive capital, rubles.

For example, if a shop's gross output volume in a year is 4.8 million rubles and the average annual value of fixed productive capital is 2.65 million rubles, the output-capital ratio will be:

$$O_f = \frac{4.8}{2.65} = 1.81 \text{ rubles of product per ruble of capital.}$$

For shops and sections in which the make-up of the fixed capital largely involves machinery and equipment (for example, the hull-processing shop), evaluation of the use of fixed capital may be done also in accordance with the machinery and equipment coefficient K_i :

$$K_i = \frac{T_f}{T_m} \quad (9)$$

where T_f is the actual time of machinery and equipment operation, hours;

T_m is the available nominal or plan time of machinery and equipment operation, hours [the nominal time available is the number of hours of machinery or equipment operation based on the shift system; the plan time available is the same except for the inclusion of anticipated (planned) losses of equipment operating time, for example undergoing repairs]

For example, if the nominal machine time available in a two-shift system and an 8-hour working day comes to 320 hours in a month (20 working days times eight hours times two shift equals 320 hours), while in actuality the machine operated for 225 hours, then

$$K_i = \frac{225}{320} = 0.7.$$

In assembly-welding, building slip, and fitting-out-installation shops, in whose production processes the work does not predominantly involve machine-tool equipment, in addition to the output-capital ratio indicator for evaluating the use of the fixed capital use is made of the shift index: the higher the shift work, the better the fixed capital is being utilized.

The shift index K_{sh} represents the ratio of the total number of workers to the number employed on the first shift (the largest in terms of workload). For example, if the shop had 560 workers, including 430 on the first shift, then

$$K_{sh} = \frac{560}{430} = 1.3.$$

that is, the shop is working on 1.3 shifts.

Ways to improve the utilization of fixed capital can be divided provisionally into two trends. The first trend includes improvement of technology, mechanization of auxiliary operations (for example, transport), and other measures to increase the intensiveness of the production process. The second involves measures of an organizational nature which increase the amount of time the fixed capital is actually in use: increasing the shift work, reducing the amount of idle time during which equipment undergoes repairs by means of careful maintenance and timely, good-quality repairs, and reducing losses of work time due to organizational-technical problems (lack of materials, tools, and so on).

Section 17. Physical Wear and Obsolescence of Fixed Capital. Amortization

Physical wear and obsolescence of fixed capital. With the passage of time, fixed capital wears out and grows obsolete. Physical wear involves the fact that with time the facilities lose their technical qualities and go out of commission entirely. Obsolescence represents a loss of value of the assets because of the fact that new and more efficient tools and machinery appear, so that the older models on hand, compared to them, become technically outmoded and economically disadvantageous. Obsolete equipment may still be completely capable of being operated.

An effective measure of countering physical wear is timely repairs to fixed capital. In this, capital repair is of special importance, during which the equipment being repaired is fully dismantled and all worn parts and assemblies are replaced; this leads to complete restoration of its work capacity. Capital repair to obsolete equipment in most cases is combined with modernization.

The word "modernization" comes from the French word "moderne"-- to make modern. For this reason, by modernization we refer to the technical improvement of existing fixed capital for purposes of bringing its technical-economic characteristics closer to a new level in accordance with technological progress. Modernization is an effective means of eliminating or substantially reducing obsolescence in fixed capital.

Amortization. Capital repair and modernization of fixed capital only postpone the time that it will go out of commission, and after a certain

length of time old capital must be replaced with new. Capital repair, modernization, and replacement of fixed capital that has been removed from production requires substantial sums. These sums are obtained through the gradual conversion of the value of the fixed capital to the value of the product being produced and accumulation of funds in Gosbank in the plant's special account. This process of gradually converting the value of the fixed capital to the value of the product for purposes of accumulating funds for capital repairs, modernization, and replacement of fixed capital is called amortization (from the Latin "amortisatio" meaning cancellation; that is, amortization in economics means cancellation of the wear of the fixed capital).

The amortization fund and the procedures of its formation. Amortization which is converted annually to the value of the product manufactured is known as amortization deductions. The size of these deductions is established on the basis of amortization norms approved by the Council of Ministers USSR, expressed as a percent of the initial value of the fixed capital. Each type of fixed capital has its own set amortization norm, based on the conditions of its operation, the rates of technological progress with respect to the given type of fixed capital, and a number of other factors. For example, fixed capital undergoing intensive operation have the highest amortization norms: tools--18 percent; working machinery and equipment--10 percent. Fixed capital that is in operation for a long time has the smallest amortization norms: buildings--3 percent; structures--5 percent.

The amount of amortization deductions for each type of fixed capital A is determined by the following formula:

$$A = \frac{F_v N}{100}, \quad (10)$$

where F_v is the average annual value of the given type of fixed capital, rubles;

N is the amortization norm, percent.

For example, if the value of a machine tool is 6,000 rubles and the amortization norm is 10 percent, then

$$A = \frac{6000 \cdot 10}{100} = 600 \text{ rubles per year.}$$

The total of amortization deductions for all types of fixed capital constitutes the enterprise's amortization fund.

The procedure for using the amortization fund is firmly fixed and may not be changed by the enterprise itself. Approximately half of the fund (47 percent) goes to capital repairs of the fixed capital. The remainder of

the fund (53 percent) is used for the complete restoration and development of fixed capital. Moreover, 45 percent of it goes into the given enterprise's production development fund and 55 percent goes to finance centralized capital investments. For greater clarity a diagram showing the utilization of the amortization fund is given in Figure 12.

Figure 12. Diagram Showing the Utilization of the Amortization Fund.



Key:

1. Amortization fund
2. Funds channeled into capital repairs
3. Funds channeled into complete restoration and development of fixed capital
4. For capital repairs to the enterprise's fixed capital
5. Reserve of the main administration
6. Into the given enterprise's production development fund
7. To finance centralized capital investments

For purposes of increasing the independence of enterprises in the matter of maintaining their own fixed capital on a modern level, they have placed at their disposal special funds in the form of the production development fund. This fund is intended for replacing worn out equipment, financing capital investments to adopt new equipment, institute mechanization and automation, modernize the equipment, acquire transport facilities, and other capital

investments channeled into production development. In addition to part of the amortization fund, the production development fund also receives funds in the form of deductions from profits. These deductions are made in accordance with established normatives and the amount of them depends on the economic results of the enterprise's operation; as these results improve the deductions on profits fed into the production development fund increase.

Section 18. Circulating Capital and Its Structure

The concept of circulating capital. Circulating capital of the physical type comprises the objects of labor: raw materials, supplies, fuel (production stocks), process stocks of products being manufactured in the form of parts, assemblies, sections, and vessels in the building slips, being fitted-out, being tested, and so on.

The most important component part of the circulating capital of a ship-building plant, which accounts for more than 70 percent, comprises production process stocks. These items are evaluated in physical terms as well as monetary terms. Stocks that are evaluated in monetary terms are called work in progress. The physical measurement of process stock is applied only on the scale of a section or a shop. For the plant as a whole the process stocks are figured only in the form of work in progress.

Whereas fixed capital represents practically the invariant portion of production, taking part in many production processes (for example, the building slips take part in the fitting-out of dozens of vessels over the course of many years), circulating capital, which comprises the objects of labor, take part only in a single production process: raw material, supplies, and purchased items come to the plant, are processed at the work places by the means of the means of labor (the fixed capital), and at the end of the production process, having been transformed into a completed ship or other item, leave the plant and come to be at the disposal of the client (consumer) in their new capacity. For this reason circulating capital, being wholly utilized in each production process and changing its physical form in the process, immediately and entirely converts its value into the value of the finished product.

The structure of circulating capital in ship-building. By the structure of circulating capital we mean its make-up in terms of components and the share of each component in the overall amount of the circulating capital. This structure depends on the technical characteristics of the product being manufactured, the technology of manufacture, and the length of the production cycle. For this reason, every sector of industry has its own structure of circulating capital.

The structure of circulating capital in the ship-building industry is shown in Table 2, where for comparison we also give corresponding data with respect to machine-building and industry as a whole.

Table 2. Structure of Circulating Capital

(1) Элементы оборотных фондов	(2) Удельное значение (доля) в общем объеме, %		
	(3) в судостроении	(4) в машиностроении	(5) в промышленности
(6) оборотные фонды всего	100,0	100,0	100,0
(7) в том числе:			
(8) производственные запасы	21,5	57,0	70,0
(9) незавершенное производство	78,0	40,0	24,0
(10) прочие оборотные фонды	0,5	3,0	6,0

Key:

1. Components of circulating capital
2. Specific value (share) in the overall volume, percent
3. Ship-building
4. Machine-building
5. Industry
6. Total circulating capital
7. Including:
8. Production stocks
9. Work in progress
10. Other circulating capital

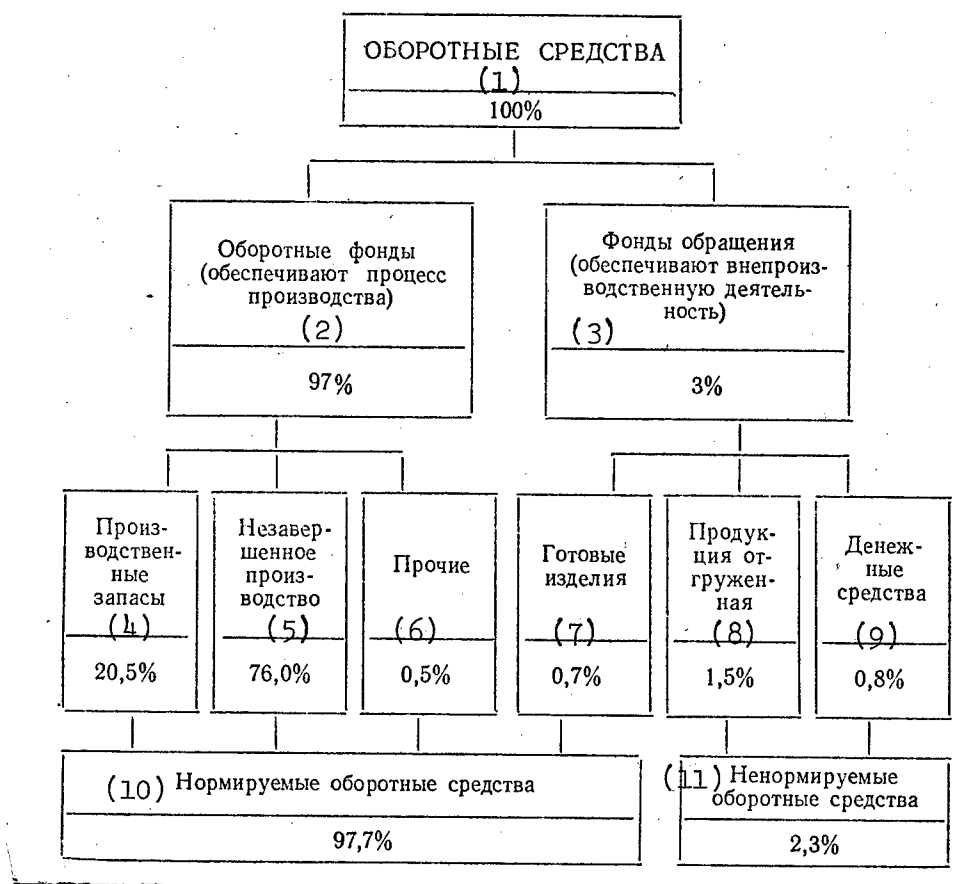
The data in Table 2 convincingly shows the direct relationship between the structure of circulating capital and the specific conditions of the sector. For example, machine-building is distinguished by its relatively long production cycle. For this reason, the share of work in progress in the fixed capital of machine-building (40 percent) is almost two times larger than in industry as a whole (24 percent). The ship-building industry is a special sector of machine-building, and the fitting-out cycle is the very longest in comparison with the manufacturing cycles of any industrial items. For this reason, the share of work in progress in ship-building (78 percent) is about two times greater than the average throughout machine building. Accordingly, in the circulating capital of ship-building there is a sharp decrease in the share of production stocks (21.5 percent as against 57 percent in machine-building and 70 percent in industry as a whole).

Section 19. Circulating Capital, Its Structure, and Utilization Indicators

The concept of circulating capital and its structure. The activities of an enterprise are not restricted to the manufacture of the product. The manufactured product must be delivered to the client and paid for. Only after money is deposited into the enterprise's current account can it consider its activity with respect to the given type of product completed. The enterprise's assets that are outside the sphere of production are called cash and disposable stocks. They include: finished goods in the enterprise's warehouses; shipped products on route; monetary funds deposited in the current account of the enterprise in Gosbank, and so on.

Thus, the production activity of an enterprise is accomplished by means of circulating capital while nonproductive activities are accomplished by cash and disposable stocks. The aggregate of an enterprise's circulating capital and its cash and disposable stocks is known as circulating assets. For greater clarity, the structure of circulating assets is shown in Figure 13 in the form of a diagram. As the figure shows, one characteristic of circulating assets in ship-building is the small share of cash and disposable stocks in them (approximately three percent as against 20 percent throughout machine-building as a whole). This circumstance results from the specific conditions of the sale of ship-building's main product--vessels. For a vessel is considered sold only after successful completion of its sea trials, at the moment when the deed of acceptance is signed. By that time the ship already has its crew on board, taking over their duties and sailing the ship to the place where it will be operated.

Figure 13. Structure of Circulating Assets in Ship-building.



Key:

1. Circulating assets
2. Circulating capital (providing for the production process)
3. Cash and disposable stocks (providing for activity outside of pro-
duction)
4. Production stocks
5. Work in progress
6. Other
7. Finished goods
8. Shipped goods
9. Monetary funds
10. Normed circulating assets
11. Non-normed circulating assets

Thus, in a ship-building plant the cash and disposable stocks--finished goods in warehouse and in the form of shipped product--do not include the ship-building product, and for this reason such stocks are relatively few.

Circulation of assets. Circulating assets of an enterprise are in constant circulation, passing through three stages and changing their physical form in the process.

During the first stage (procurement), monetary funds of an enterprise are channeled into the acquisition of raw materials, supplies, purchased items, and other components that are necessary for production. As a result, circulating assets in a plant take the form of production stocks.

During the second stage (the production stage), circulating assets in the form of production stocks go into the shops and, passing through all of the stages of production, are transformed initially into work in progress and then into the finished product.

During the third stage (the sale stage), the circulating assets in the form of the finished product are conveyed to the client (sold); the client pays the enterprise for it. In this way, at this stage the enterprise's circulating assets are again converted into money, and the process of asset circulation begins once more.

The norming of circulating assets. Acceleration of the circulation of assets is of great economic importance. In practice this is known as acceleration of the rate of turnover of circulating assets. It may be achieved by reducing warehouse stocks and shortening the production cycle and accelerating the sale of the finished product--that is, the normal production activity of the enterprise can be accomplished with fewer means. Assets that are released in this way can be channeled by the state into other purposes. For this reason, most circulating assets are normed and their amount is established not arbitrarily but on the basis of approved norms. Normed circulating assets comprise all circulating capital and finished goods. Shipped goods that are on route as well as monetary funds are nonnormed circulating assets (see Figure 13).

The norming of circulating assets consists of the following.

With respect to each component of normed circulating assets (production stocks, work in progress, and so on) the higher-level organization confirms the norm of circulating assets, expressed in relative amounts: in days of supply stocks, in percentage of the total outlays, and so on. The approved norm serves as the basis for establishing the amount of requirement with respect to individual types of normed circulating assets which is known as the circulating assets normative. The amount of the normative N_0 is determined by the formula

$$N_0 = \frac{Z_v}{T_k} N_z \text{ rubles,} \quad (11)$$

where Z_v is the annual total outlays with respect to a given type of circulating assets, rubles;
 T_k is the number of calendar days in the planning period;
 N_z is the stocks norm with respect to the given type of circulating assets, days.

For example, if the annual consumption of sheet steel is 960,000 rubles and the stocks norm is 90 days, then

$$N_o = \frac{960}{365} \cdot 90 = 237,000 \text{ rubles.}$$

The total normatives for all types of normed circulating assets is known as the total normative of the enterprise's circulating assets. This amount determines the total enterprise requirement for normed circulating assets averaged over one year. However, in the course of a year, depending on production conditions, the enterprise may require more or fewer circulating assets than the yearly average. For this reason, the total normative of circulating assets is revised individually for each quarter.

Indicators of the use of circulating assets. As has been mentioned already, acceleration of the turnover rate of circulating assets is of great economic importance. For this reason, evaluation of the turnover rate is an important economic task and is accomplished by means of an indicator known as the turnover rate coefficient K_{tu} :

$$K_{tu} = \frac{P_r}{S_o}, \quad (12)$$

where P_r is the product sold during a year, rubles;

S_o is the average annual amount of circulating assets, rubles.

For example, if the plant during the course of a year has sold goods worth 80 million rubles and has had 20 million rubles in circulating assets, then

$$K_{tu} = \frac{80}{20} = 4.$$

The turnover rate coefficient $K_{tu}=4$ means that every ruble in circulating assets has been cycled four times during the year. In other words, for every ruble of circulating assets during the course of a year the plant turned out goods worth four rubles.

The smaller the production cycle the larger the turnover rate coefficient will be. For example, in the automotive industry the turnover rate coefficient is 8. In the ship-building industry, because of the lengthy production cycle, the turnover rate coefficient is the smallest among all sectors of industry (approximately 1 to 1.5). For this reason, the task of accelerating the turnover rate of circulating assets in ship-building is an especially urgent one and can be resolved primarily through systematic efforts to reduce fitting-out cycles.

In practice, instead of the turnover rate coefficient another indicator is frequently used--the turnover rate of assets in turnover days D_o :

$$D_o = \frac{T_k}{K_{tu}} \quad (13)$$

where T_k is the number of calendar days in the planning period.

If we insert into formula (13) the value of K_{tu} in accordance with formula (12), we get

$$D_o = \frac{T_k S_o}{P_r} \quad (14)$$

For example, if during the course of a year the plant has had an average of 20 million rubles in circulating assets and has sold to the clients goods worth 80 million rubles, then

$$D_o = \frac{365 \cdot 20}{80} = 91 \text{ days.}$$

Section 20. Payment for Productive Capital

By productive capital of an enterprise we mean the total amount of its fixed productive capital and normed circulating assets figured on an average annual basis.

The productive capital of enterprises constitutes the fundamental material of a socialist society. And how rationally this capital is utilized largely determines the economic effectiveness of industrial production and, in the long run, the level of the people's material well being. For this reason, it is extremely important that the society achieve a situation in which every enterprise takes every step necessary to make the most efficient use of the national resources entrusted to them to be used as productive capital.

In order to increase the motivation of enterprises to resolve this task of national importance, the practice of paying for productive capital has been

adopted. The essence of paying for productive capital is that an enterprise pays a certain amount from its profit into the state budget as a first priority matter, proportional to the amount of the productive capital: the larger the amount of the capital being used the larger the payment for it, and vice versa. The specific amount of payment for the capital is established on the basis of a norm of payment fixed for each enterprise in the form of a percentage of the average annual amount of the productive capital.

For most of the ship-building plants, the payment norm is six percent, and only certain plants, by way of exception, have the norm fixed in the amount of three percent. For example, if the average annual value of the fixed productive capital is 134 million rubles and the average annual amount of normed circulating assets is 33 million rubles and the norm of payment is six percent, then the amount of annual payment will be:

$$\frac{134 + 33}{100} \cdot 6 = 10 \text{ million rubles.}$$

Payment for capital is paid into the state budget every month. As a rule, monthly payments for capital must amount to 1/12 of the annual amount. However, ship-building plants which are located on bodies of water that are frozen in winter and in early spring cannot deliver ships during those periods and consequently do not make much profit. For such plants the annual capital payment is distributed by quarters and months proportionally to the amount of the planned profit.

CHAPTER 6. PRIME COST, PROFIT, AND PRODUCT PRICE IN SHIP-BUILDING

Section 29. Prime Cost of Product

The concept of prime cost. The preceding chapters show that the process of goods production is indissolubly linked to constant outlays of monetary funds of an enterprise: the enterprise buys raw material, supplies, sets of equipment, fuel, electricity, and so on; fixed capital wears out, and to maintain them in functioning condition the enterprise expends considerable sums which are covered by amortization deductions; the enterprise pays for the labor of its workers by means of wage outlays, and so on. The total of all monetary outlays of an enterprise involved in goods production and sales (disposal) is known as the prime cost of goods.

The prime cost of goods is an important indicator of the production-economic activity of an enterprise. It reflects in final form all processes involved in the manufacture of the product: the level of labor productivity, the status of the organization of production, and the degree of utilization of fixed and circulating capital. For this reason, the better the organization of the enterprise's production-economic activity the smaller the outlay of assets for the manufacture of the product--that is, the smaller the prime cost.

In amalgamated form the structure of the prime cost can be depicted in the following form:

$$S = M_z + A + Z \text{ rubles,} \quad (19)$$

where M_z is the material outlays, rubles;

A is the amortization deductions, rubles;

Z is the wages paid to the enterprise's workers, rubles.

Indicators of prime cost of goods. The main indicator of the prime cost of goods is the full prime cost per unit of product. For example, the total amount of outlays of a plant for the building of one dry-cargo ship is 7.288 million rubles--that is, the full prime cost of building the ship is 7.288 million rubles. The portion of the prime cost of unit of product which incorporates outlays for the operations of an individual shop is known as the shop prime cost of unit of product.

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On the basis of data on the prime cost of unit of product we establish the total amount of all enterprise outlays for the production of all its goods during the course of a quarter and a year. This generalizing indicator of prime cost is known as the estimate of outlays for production.

In machine-building, and especially in ship-building with its lengthy production cycle, not all goods manufactured during a given period are transformed into finished goods during the same period (ships, machinery, and so on). A portion of the product remains in the shops in uncompleted form and is known as work in progress (parts, assemblies, sections, ships and building slips and in the fitting-out pier, and so on). For this reason, in the estimate of outlays for production the prime cost of the commercial (finished) product is listed separately.

Direct and indirect outlays for the manufacture of goods. In terms of their economic content, outlays for the manufacture of goods are grouped in accordance with the following outlay components:

basic supplies;

sets of items (contract agent deliveries) and contract agent operations;

auxiliary supplies;

fuel bought elsewhere;

power bought elsewhere;

amortization of fixed capital;

basic and supplementary wages;

deductions for social security;

other monetary outlays.

In accordance with these economic components we determine outlays for production as a whole (the estimate of outlays for production).

The specific value (share) of individual outlay components within the entire amount characterizes the structure of the prime cost. Table 4 shows the structure of the prime cost in 1968 throughout the country's industry as a whole, and with respect to the ship-building industry in particular.

Table 4. Structure of Prime Cost of Product by Economic Components

№ п. п. (1)	Элементы затрат (2)	Удельное значение (доля), %	
		(3) в судо- строении (4)	в машино- строении (5)
1	(6) Основные материалы и комплектующие изделия	65	53
2	(7) Вспомогательные материалы	2	4
3	(8) Топливо со стороны	1	1
4	(9) Электроэнергия со стороны	2	2
5	(10) Амортизация основных фондов	4	5
6	(11) Варовная плата	18	28
7	(12) Отчисления на социальное страхование	1	2
8	(13) Прочие денежные расходы	7	5
Итого		100	100

Key:

1. Number in sequence
2. Outlay components
3. Specific value (share), percent
4. Ship-building
5. Machine-building
6. Basic supplies and sets of items
7. Auxiliary supplies
8. Purchased fuel
9. Purchased electricity
10. Amortization of fixed capital
11. Wages
12. Deductions for social security
13. Other monetary outlays
14. Total

In determining the prime cost of unit of product, grouping outlays by economic components proves unsuitable, because some of them are general in character and cannot be directly related to the prime cost of specific goods. For example, wages paid to enterprise managers and administration personnel or wages paid to shop managers and shop office personnel are socially essential components of outlays for goods production. However, assigning it directly to a specific ship or machine is impossible because all such personnel serve the construction of not just a single ship or series of ships in a single project but rather all the plant's production as a whole.

For this reason, in order to determine the prime cost of unit of product all outlays are subdivided into direct and indirect. To direct outlays we assign those that can be incorporated in the prime cost of the goods

directly: outlays for basic supplies, sets of items and contract agent operations, basic wages paid to production workers and deductions for social security from such wages, amortization of the building slip and the cost of power and fuel used in the building slip during ships' testing, and also a portion of other monetary costs. Indirect outlays include those which cannot be assigned directly to specific goods. Indirect outlays are assigned to the prime cost of individual types of goods by the indirect method (by distribution). These include the cost of auxiliary supplies and the main portion of the fuel and power, wages paid to auxiliary workers, engineering-technical personnel, employees, junior service personnel and security and deductions for social security on such wages, as well as amortization of fixed capital (except for the building slip) and a portion of other monetary expenditures.

Indirect expenditures made in shops are known as shop expenditures. These expenditures, made on a plant-wide scale as a whole, are known as all-plant expenditures. The total amount of indirect expenditures is known as overheads. For this reason, frequently indirect expenditures made in shops are known as shop overheads (TsNr), in order not to confuse them with other shop expenditures of direct nature.

The procedure of assigning indirect (overhead) expenditures on the prime cost of unit of product. Indirect expenditures are assigned to the prime cost of unit of product by distributing them proportionately to the main wages of production workers (exclusive of additional payments in accordance with the progressive piece-work system but including bonuses paid to workers whose wages are based on time rates). For this, what is known as a percentage of shop and all-plant overhead expenditures is established; it represents a percentage of each of the expenditures from the total sum of basic wages paid to production workers of the plant as a whole. For example, the main wages paid to production workers in a plant in a year's time come to 7.3 million rubles; shop overhead expenditures come to 12.6 million rubles, and all-plant overheads come to 4.25 million rubles. From this the percentage of shop expenditures equals $\frac{12,600}{7,300} \times 100 = 173$ percent, and the percentage of all-plant expenditures correspondingly equals $\frac{4,250}{7,300} \times 100 = 58$ percent.

To determine the specific amount of indirect expenditures necessary for a single item we take the amount of basic wages paid to production workers of a plant with respect to this item and multiply it by the established percentage of shop and all-plant expenditures. For example, if the basic wages paid to production workers in a plant with respect to the building of a ship come to 609,000 rubles, then the shop expenditures will be $\frac{609}{100} \cdot 173 = 1.05$ million rubles; all-plant expenditures correspondingly will be $\frac{609}{100} \cdot 58 = 353,000$ rubles.

The influence of production volume increase on the absolute and relative amount of indirect expenditures. The amount of direct expenditures made by an enterprise during the course of a year increases in direct proportion to the rise in production volume if we do not consider the implementation of technical measures aimed at reducing material and labor outlays per unit of product. The rise in production volume exerts another effect on the amount of indirect expenditures. The absolute amount of indirect expenditures also increases as production volume rises, but this rise lags considerably behind the rise in production volume--that is, with a rise in production volume, each unit of production accounts for a smaller amount of indirect expenditures than during the preceding year, and the relative amount of such expenditures (with respect to unit of production) decreases. This regular pattern is of great economic importance and is one of the basic trends in reducing production prime cost.

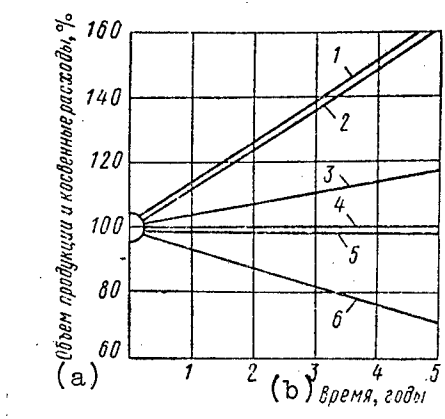
The relative decline in indirect expenditures per unit of production along with a rise in production volume results from the fact that indirect expenditures are not uniform with respect to the nature of their connection with the production process. For example, all-plant expenditures are those expended on the administration and business maintenance of the enterprise as a whole. These expenditures increase practically not at all as the volume of manufactured goods rises.

In terms of their connection to the production process, shop expenditures are divided into two groups: group A comprises all-shop expenditures on the administration and business maintenance of the shop, and group B comprises expenditures relating to equipment operation.

The expenditures of group B rise in direct proportion to the rise in production volume and are therefore known as the variable portion of shop expenditures. Expenditures of group A, similar to all-plant expenditures, are practically independent of the rise in production volume and are known as the provisionally-constant portion of shop expenditures. These provisionally-constant expenditures make up about 60 percent of the total amount of shop expenditures.

The relationship between the amount of indirect expenditures and the rise in production volume is depicted graphically in Figure 17.

Figure 17. Relationship between Indirect Expenditures and the Rise in Production Volume (in percentage of base year)



1 -- production volume; 2 -- variable portion of indirect shop expenditures; 3 -- total amount of indirect shop expenditures; 4 -- provisionally-constant portion of indirect shop expenditures; 5 -- all-plant indirect expenditures; 6 -- total amount of indirect expenditures per unit of production.

Key:

- a. Production volume and indirect expenditures, percent
- b. Time, years

Ways of reducing the prime cost of the product in ship-building. Reducing the prime cost of the product, and the savings on resources derived from this, constitutes a major source of increasing the national income and additionally increasing production in the interests of improving the material well-being of the workers. Reducing the prime cost of the product involves saving on raw materials, supplies, fuel, tools, live labor, and so on. And saving on material assets is economically equivalent to additional production of them.

There are two main trends in reducing the prime cost:

- 1) increasing the level of technology and the organization of production and
- 2) increasing the volume of the product that is turned out.

Increasing the level of technology and the organization of production is accomplished by adopting new equipment and production technology, mechanization and automation, strengthened specialization, and the use of standardized and technological structures. One result of this is increased labor productivity and reduced labor and material outlays per unit of production.

Increasing the volume of goods that are turned out is accomplished in two ways: by increasing the number of personnel and by increasing labor productivity. There are no other factors leading to increased production volume. The connection between increased production volume and a rise in the number of workers and labor productivity has the following mathematical expression:

$$\Delta P = \Delta C \Delta P_{1a}, \quad (20)$$

where ΔP is the index of the increase in production volume;
 ΔC is the index of increase in number of personnel;
 ΔP_{1a} is the index of increased labor productivity.

For example, if the increase in the number of personnel is two percent (index of increase 1.02), and the increase in labor productivity is eight percent (index of increase 1.08), then the index of increase in production volume will be:

$$\Delta P = 1.02 \cdot 1.08 = 1.102,$$

that is, the increase amounts to 10.2 percent.

Increasing the volume of production output leads to reduced production prime costs, because this reduces the provisionally-constant expenditures per unit of product.

Most of the increase in production volume both in the country's industry as a whole and in ship-building is achieved by increasing labor productivity. For example, in 1971 this provided 87 percent of the increase in industrial output, and increasing the number of personnel provided only 13 percent of the total increase. Consequently, increased labor productivity with the adoption of new equipment, the use of advanced designs, mechanization, and automation of production and better organization constitutes a basic factor in reducing the prime cost. This steady reduction in the prime cost of the goods takes place as a result not only of direct reduction of labor outlays but also reduced provisionally-constant expenditures per unit of production.

Ship-building is one of the most labor-intensive sectors of industry. Under such conditions the significance of the labor productivity factor in reducing the prime cost of production rises considerably. But at the same time we must not forget about saving on material resources achieved thanks to the rational cutting of sheet metal, reducing waste in insulating materials, pipes, and so on, also through improved design of ships along lines of raising their technology level and using advanced materials.

Within material outlays spent on the building of ships, most is accounted for by the cost of sets of equipment delivered to the ship-building plant via sector and inter-sector cooperation. Reducing the cost of these

deliveries constitutes a large reserve in reducing the prime cost of the vessels. If the above mentioned ways of reducing the prime costs of ships can be characterized as intra-facility reserves of ship-building plants, then reducing the cost of sets of equipment constitutes a national reserve the utilization of which depends on the effectiveness of the work of many sectors of industry.

In all sectors of machine-building, reducing the production cycle of goods manufacture leads to reduction of prime costs, because reduction of the cycle itself results primarily from reduced labor-intensiveness and the resulting boost in labor productivity. In ship-building, reducing the cycle of ship construction also has a direct effect on reducing the prime cost of the construction if it is achieved by reducing the building-slip and fitting-out periods and the length of ship testing. Reducing the prime cost of ships thanks to this factor is the consequence of two causes.

First, building slips and hydraulic structures located in the water area of the plant (caissons, dry and floating docks, and so on) are very costly structures. The amount of their amortization is assigned to the prime cost of the vessels directly--that is, proportionally to the time of their utilization for each ship. For example, in the prime cost of a dry-cargo ship of 7.288 million rubles, amortization of the building slip and the caisson will account for 105,000 rubles.

Second, the maintenance of the ship in the building slip, in the fitting-out, and during the testing requires considerable work involved in economic servicing: lighting, heating, housekeeping, the maintenance of order in its numerous compartments and the safeguarding of costly equipment. The amount of expenditures on carrying out this work depends only on one factor--the length of time the ship spends in the building slip, in the fitting-out, and in the tests. And every day that is saved means a direct reduction in the outlays spent on the ship's construction, figured in many thousands of rubles.

Section 30. Principles of Calculating Production

The concept of calculation. In the preceding section it was noted that the main indicator of the prime cost is the prime cost of production unit. The figuring of the prime cost of manufacturing a unit of specific production is known as calculation. The frequently-encountered expression "calculate the prime cost of production" is incorrect. Work done to determine the amount of outlays on the manufacture of a unit of production should be known as either figuring the prime cost or calculation. Engineering-technical personnel engaged in figuring the prime cost of production unit are known as enginner-calculators.

Types of calculation in ship-building. In ship-building, estimate, planning and report calculations are drawn up. Estimate calculations are formulated to establish prices on ships of new projects. By means of planning calculations we establish the planned amount of outlays spent on the construction of a specific ship, separating out the planning prime cost of the work for each shop taking part in the ship's construction. Report calculations are drawn up in accordance with accounting data concerning the actual outlays, and they serve as a control on the fulfillment of the plan with respect to prime cost, to study its dynamics and to seek out reserves for further reducing the prime cost.

The structure of calculation of a ship. It was mentioned above that when determining the prime cost of a unit of production, grouping outlays with respect to economic components proves unsuitable because of the presence of indirect outlays. For this reason, when determining the prime cost per unit of production outlays are grouped not by economic components but by what are known as items of calculation. The use of items of calculations makes it possible to distribute all indirect expenditures for each unit of production across special complex items---items of shop and all-plant expenditures.

In ship-building, the planning and accounting of the prime cost of ships is accomplished in accordance with the following items of calculation:

supplies;

basic wages paid to production workers;

shop expenditures;

all-plant expenditures;

contract agent deliveries and work;

special and other direct expenditures;

expenditures outside of production.

The calculation item "Materials" includes outlays on materials that go into the design of the ship---what are known as basic materials, as well as the cost of purchased semi-finished products, semi-finished products manufactured in the plant, and items of general industrial application (brackets, accessories, bearings, shock absorbers, fittings, and other materials). The amount of material required and the overall amount of outlays with respect to this item to a considerable extent depend on the level of technology and the organization of production, on how the accounting of materials is set up in the shop, how they

are stored, and how control is exercised over their rational use. For this reason, the amount of material outlays must be included in the planned and actual prime cost of the work of each shop--the shop prime cost of product.

In addition to the above material outlays, the item "Materials" also includes the cost of business supplies, accessories, nipple connections, ventilation heads, and other non mechanical equipment for ships' systems and pipe conduits delivered through inter-plant cooperation (MZK); ships' furnishings, spare tools, and accessories; and transport-procurement expenditures in the amount of about six to eight percent of material outlays.

The cost of waste with respect to the price of their sale (disposal) is excluded from the overall amount of material outlays.

The calculation item "Basic Wages Paid to Production Workers" includes the basic wages paid to production workers directly participating in the building of a given ship. These outlays are completely dependent on the level of equipment and the organization of production of the specific shop and must be included in the shop prime cost.

The complex item of calculation "Shop Expenditures" includes expenditures on the maintenance and operation of equipment, on shop maintenance and administration, and number of other indirect expenditures. The amount of these expenditures is included in the shop prime cost.

The complex calculation item "All-Plant Expenditures" includes the plant's outlays on all its maintenance and administration: wages paid to all-plant personnel, expenditures on business trips, postage and telegraph expenditures, the amortization of all-plant fixed capital, and other general business expenditures. The work of each shop influences the amount of these expenditures only indirectly and is not subject even to rough evaluation. For this reason, all-plant expenditures must not be included in the shop prime cost.

The calculation item "Contract Agent Deliveries and Work" includes the cost of ships' mechanical, electrical equipment, and special equipment, transport-procurement expenditures with respect to these (approximately 4 percent of the cost of the equipment), and the cost of master installation work involved in the installation, adjustment, and testing of equipment. These outlays in shipbuilding are very large and are therefore assigned to a special calculation item which is not found in the standardized general-industrial list of calculation items. Outlays on contract agent deliveries and work do not depend on the work of the shops and must not therefore be included in the shop prime cost.

The calculation item "Special and Other Direct Expenditures" includes individual expenditures on the servicing of the building of a given ship on the part of outside organizations (central design bureaus, scientific-research institutes, Registry agencies, and so on), as well as the cost of the rigging, special tools, the maintenance of hoisting and transport machinery, the amortization of the building slip and hydraulic structures and so on. These expenditures for the most part also are independent of the work of the shops and must not be included in the shop prime cost.

The total expenditures on the above items of calculation constitute the plant prime cost of the unit of production.

In addition to the production expenditures of shops and all-plant outlays, all industrial enterprises make what are known as expenditures outside of production. These include expenditures relating to the sale of the product and the training of cadres, deductions into the fund for the introduction of new equipment, and so on. The amount of these expenditures comes to approximately one percent of the plant prime cost.

The plant prime cost, augmented by the amount of expenditures outside of production, is known as the full prime cost of unit of product.

General concepts of the method of calculation. Calculation of the construction of a ship or an individual structural component of a ship (section, installation, and so on) is accomplished on the basis of technically substantiated norms of material and labor outlays formulated by the plant's technical services. In calculating the construction of prototype ships and the first group of series ships, widespread use is also made of report data concerning the prime cost of building prototype ships, which are appropriately analyzed and used to work out consolidated normatives of material and labor outlays per unit of measurement. The particular measurement used is one ton of net weight of the ship or individual structural part. With account taken of structural differences between the ship under construction and its prototype, as well as differences in the technology of the construction, expenditures per unit of measurement are adjusted by means of an enlargement or reduction coefficient.

Table 5 by way of example shows a total calculation sheet for the construction of a dry-cargo ship. The full calculation of the ship together with the necessary substantiations of the amount of expenditures with respect to each item represents a bulky volume of bound material containing 300 to 400 sheets of typed text, lists, and tables.

Table 5. Calculation for the Building of a Dry Cargo Ship
(Total Sheet)

№ (1)	Статьи калькуляции (2)	Единица измерения (3)	Сумма или % (4)	Примечание (5)
1	(6) Материалы	тыс. руб.	17) 1674	(18) приложение 1
2	(7) Зарботная плата производ- ственных рабочих	» »	610	» 2
3	(8) Цеховые расходы	%	173	} » 2
4	(9) Общезаводские расходы	тыс. руб.	17) 1050	
		%	58	
5	(10) Контрагентские поставки и работы:	тыс. руб.	17) 353	
-	(11) поставки	» »	2701	» 3
	(12) работы	» »	400	» 4
6	(13) специальные и прочие пря- мые расходы	» »	428	» 5
	(14) заводская себестоимость	» »	7216	—
7	(15) непроизводственные рас- ходы	» »	67	—
	(16) полная себестоимость	» »	7283	—

Key:

1. Number in sequence
2. Calculation items
3. Unit of measurement
4. Total or percent
5. Remark
6. Materials
7. Wages paid to production workers
8. Shop expenditures
9. All-plant expenditures
10. Contract agent deliveries and work:
11. Deliveries
12. Work
13. Special and other direct expenditures
14. Plant prime costs
15. Expenditures outside of production
16. Full prime cost
17. Thousands of rubles
18. Appendix

To the total calculation sheet in the form of Appendix I is added a full interpretation of all used materials and items, indicating their quantity, wholesale prices per unit, and total cost. The basis for computing the amount of material outlays is a list of consumption norms of materials, semifinished products, general-industrial items, and MZK, drawn up by divisions of the chief technologist and the chief designer and approved by the plant director. Computation of the cost

of the ships' furnishings, spare tools, and accessories is accomplished in accordance with the list of the project design office, coordinated with the client. Computation of material outlays is done in accordance with a special form (Table 6).

Table 6. Computation of Cost of Materials

№ п. п. (1)	Группа материалов (2)	Количество, т (3)	Стоимость в оптовых ценах, руб. (4)	
			(5) единицы	(6) всего количества
	(7) I. Черные металлы			
1	(8) Балки и швеллеры	7,44	106,0	789
2	(9) Крупносортовая сталь и т. д.	464,01	112,6	55 496
	(10) Итого черные металлы			640 546
	(11) II. Трубы, баллоны, фитинги			
1	(12) Трубы катаные и т. д.	74,60	169,8	12 662

Key:

1. Number in sequence
2. Group of materials
3. Quantity, tons
4. Value in wholesale prices, rubles
5. Units
6. Total quantity
7. I. Ferrous metals
8. Girders and channel bars
9. Large section steel, and so on
10. Total ferrous metals
11. II. Pipes, cyclinders, fittings
12. Rolled pipes and so on

Appendix II gives the basis for the amount of wages paid to production workers of the plant as well as shop and all-plant overheads. This substantiation is made on the basis of a norm of labor-intensiveness of ship construction, with subdivision by shops, and the approved level of shop and all-plant overheads in the form of their percentage relationship to the base wages paid to plant production workers. The norm of labor-intensiveness is worked out by the division of the chief technologist along with the division of labor and wages, while the percentage of overheads is worked out by the planning-economic division. The form of computation of the base wages is given in Table 7.

Table 7. Computation of Amount of Base Wages Paid to Production Workers and Overheads

(1) Цехи-исполнители	(2) Норма трудо- емкости, нормо-час	(3) Средняя тарифная ставка 1 нормо- час., руб.	(4) Зарплата производ- ственных рабочих, руб.	(5) Цеховые накладные расходы, %	(6) Сумма цеховых накладных расхо- дов, в руб.	(7) Общезаводские накладные расходы, %	(8) Сумма общезавод- ских накладных расходов, руб.
1	14 000	0,45	6300	193	12 169		
9	10 300	0,52	5355	280	15 000		
...		
(9) Итого...	1 160 000	0,53	610 000	173	1 050 000	58	353 000

Key:

1. Operating shops
2. Norm of labor intensiveness, norm-hours
3. Average basic wage rate per norm-hour, rubles
4. Wages paid to production workers, rubles
5. Shop overheads, percent
6. Total shop overheads, rubles
7. All-plant overheads, percent
8. Total all-plant overheads, rubles
9. Total

To the total calculation sheet Appendix III adds a full interpretation of contract agent deliveries and their value. The basis for this is the customer delivery list drawn up by the ship's designer, priced in accordance with the price list or contract prices. Detailing and substantiation of the cost of contract agent work (Appendix IV) is done in accordance with data of the division of external cooperation and the chief builder of the ship series. These divisions determine the list of equipment which requires for its installation, adjustment, and testing the participation of specialists from the delivering plant (master installation workers), as well as the master installation work timetable and the number of the personnel. For example, the installation and adjustment of diesel generators requires the participation of a crew of master installers consisting of two men for a period of 28 days. If wages are paid at the rate of 20 rubles per man-day, the total cost of this master installation work will be $2 \cdot 28 \cdot 20 = 1,120$ rubles.

Substantiation of the amount of special and other direct expenditures is made in accordance with data from many plant offices. For example, the technical offices substantiate the cost of servicing the building of the ship on the part of the designer and the scientific-research institutes; the division of the chief technologist works out a list of rigging and special tools and, together with the planning-economic division and the operating shops, determines their cost; the planning-economic division together with the chief architect determines the length of the building slip period of the construction and computes the amount of building slip amortization, and so on.

Calculation on the completion of individual structures (jobs) within one shop is made in accordance with the same pattern but in simplified form, namely:

computation is made only by items, including outlays that are assigned to the shop prime cost: by materials, base wages paid to production workers, and shop expenditures;

instead of approved norms of material and labor outlays use is made of direct computation of necessary materials as specified by blueprint and direct norming of the work in accordance with the technology-norming chart;

the percentage of shop expenditures is taken in accordance with its planned level for the given month.

Section 31. Product Price

Concept of the product price and the basis of establishing it. Production under socialism represents the manufacture of products not for private consumption but for sale. This kind of production is known as commercial. The sale of a product--product disposition--is made in accordance with the effect of the law of value. The essence of this law is that the sale of goods (exchange of goods) is made in accordance with the socially essential labor expended on the production of such goods--that is, in accordance with their value. Product price is the monetary expression of its value.

The price of a product, according to the law of value, should express the socially essential labor expended on manufacturing it; this refers not only to the live labor of the workers in a given enterprise but also passed labor, embodied in materials, deliveries of sets of equipment, and other components of outlays. The basis for determining the amount of socially essential labor outlays for the manufacture of a specific product is its estimated calculation under average production conditions. Moreover, a given product may be being manufactured by several enterprises, among which some may have better conditions of production than others.

In ship-building, instances of several plants being involved in the simultaneous construction of ships in a single project are encountered rarely. For this reason, as a rule the determination of the amount of socially essential labor outlays in establishing prices on ships is based on estimated calculation as agreed on with the clients--the Ministry of Maritime Fleet and the Ministry of River Fleet and the Ministry of Fishing Industry.

Profits and profitability norm in ship-building. Estimated product calculation is the basis for setting prices; but the price of the product does not equal its prime cost. In addition to its prime cost, the price of a product should reflect the amount of surplus product created by labor for society.

Surplus value created by labor for society is net income of the society and takes the form of profit and turnover tax. Profit in an established amount goes into the price of the product of any sector or industry, while turnover tax only goes into the price of products of the light and food industry. The amount of turnover tax on products from the light and food industry is such that it provides the state with net income created not only in these sectors but also in enterprises of heavy industry which sell their goods at prices lower than cost--that is, without a turnover tax.

The profit which is included in the product price must be of a size which permits a normally operating enterprise:

to make payments for productive capital in the amount of six percent of its average annual value;

to pay interest for the use of bank credit;

to make deductions into its own economic incentive funds (the material incentive fund, the social-cultural and housing construction fund, and the production development fund);

to enlarge its circulating assets and also to cover certain other of its financial resource needs.

In working out prices, the absolute amount of profit is set by means of the indicator of profitability with respect to the full prime cost.

Profitability is a relative indicator which is required to evaluate the level of profit, and it is measured as a percentage relationship of the absolute amount of profit to any base indicator taken to be a unit. In this case, profitability R_s with respect to the full prime cost is the percentage relationship of the absolute amount of profit to the full prime cost of the product and is expressed by the following formula:

$$R_s = \frac{P_b}{S_p} \cdot 100 \text{ percent,} \quad (21)$$

where P_b is the profit, rubles;

S_p is the full prime cost of the product, rubles.

For example, the annual profit of an enterprise is 5.014 million rubles and the full prime cost of the product is 33.425 million rubles. In that case, profitability with respect to prime cost will equal:

$$R_s = \frac{5014}{33425} \cdot 100 = 15 \text{ percent.}$$

Fifteen percent profitability with respect to prime cost means that the enterprise earns 15 kopeks in profit for each ruble spent.

For use in price formation, the normative amount of profitability with respect to prime cost is set in differentiated fashion for each sector, based on the capital-labor ratio and the labor-intensiveness of the product. For example, the normative profitability with respect to prime cost is set at seven percent for the tractor industry, 10 percent for the automotive industry, and 15 percent for the ship-building industry.

Knowing the amount of full product prime cost and the normative profitability, using formula (21) it is easy to determine the amount of profit to be included in the product price. For example, if the full prime cost of a ship is 7.283 million rubles and the normative profitability with respect to prime cost is 15 percent, then

$$P_b = \frac{S_p R_s}{100} = \frac{7283 \cdot 15}{100} = 1.082 \text{ million rubles.} \quad (22)$$

Types of prices and their structure. In the country's national economy there are three types of prices: enterprise wholesale prices, industry wholesale prices, and retail prices.

Enterprise wholesale prices are prices at which industrial enterprises sell (dispose of) their products to other enterprises.

Industry wholesale prices are prices at which industrial enterprises sell their products to trading organizations. They are approved only for consumer items.

Retail prices are prices at which consumer items are sold to the public. The structure of an enterprise wholesale price includes the full prime cost of the product and a normative profit set by higher-level planning organs. For example, if the full prime cost of a dry cargo ship is 7.283 million rubles and the normative profit is 1.082 million rubles, then the ship's wholesale price will be $7.283 + 1.082 = 8.365$ million rubles.

An industry wholesale price is obtained by adding to the enterprise wholesale price a turnover tax and the surcharge of the industry sales agencies.

A retail price is formed by adding the trade markup to the industry wholesale price.

The surcharge of the industry sales agencies is provided to cover the expenses of selling the product. Similar to this, the trade makeup also pays the expenses of the trading organizations and, in addition, insures them a certain profit. A diagram of the price structure is given in Figure 18.

Figure 18. Diagram of Price Structure.

Полная себестоимость продукции (1)	Нормативная прибыль предприятия (2)	Налог с оборота (3)	Наценка сбытовых органов промышленности (4)ности	Торговая наценка (5)
Оптовая цена предприятия (6)				
Оптовая цена промышленности (7)				
Розничная цена (8)				

Key:

1. Full prime cost of product
2. Normative profit of enterprise
3. Turnover tax
4. Surcharge of industry sales agencies
5. Trade markup
6. Enterprise wholesale price
7. Industry wholesale price
8. Retail price

Procedure for setting wholesale prices on ship-building production. Ship-building uses only enterprise wholesale prices. Approximate wholesale prices are formulated for ships being built in accordance with new projects. They are set for the prototype vessel and for the first group of series ships the construction of which was begun prior to confirmation of the permanent wholesale price. Preliminary calculations are made in accordance with the approximate prices. In order to set approximate prices for ships in new projects the designer of the ship, on the basis of materials of the technical project, draws up an estimation calculation and coordinates it with the plant building the ship. The agreed-on estimation calculation is submitted for technical-economic appraisal.

The draft approximate price, together with conclusions by the board of appraisal, the Main Administration (in accordance with the subordination of the designer) and the main planning-production administration, is

examined at a scientific-technical council of the Ministry as part of the technical design of the new ship. In accordance with the results of confirmation of the technical design, the Main Administration confers with the main client and confirms the approximate price of the prototype and the first group of series ships.

Wholesale prices on remaining series ships are set on the basis of report-estimate calculations of the constructing plant. These calculations are known as report-estimate calculations because they also include actual data on the prime cost of the prototype ship and the first series ships delivered over by that time. The draft wholesale prices on ships whose engines exceed 400 horsepower are coordinated with the main client and submitted to the State Committee on Prices for confirmation and incorporation in the price list. For remaining ships, the prices are confirmed by the Ministry in coordination with the main client.

Estimate calculations for establishing approximate and wholesale prices must be appropriately substantiated and detailed with respect to all calculation items. In addition, the following are appended to them:

comparative tables of technical-economic indicators of ships of the new project and previously built ships of similar projects;

an explanatory list which lays out the characteristics of the new project, a brief technical description, conclusions from other comparative tables of technical-economic indicators, and other supplementary substantiations to the draft price.

Section 32. Plant Balance Profit and Its Use

Profit and its significance to the national economy. In its general form, profit is the net income of an enterprise, established as the difference between monies received for all products sold and the costs of manufacturing them. In its general form, the formation of profit P_b of an enterprise has the following expression:

$$P_b = P_r - S_r \text{ rubles,} \quad (23)$$

where P_r is the volume of products sold, rubles;

S_r is the prime cost of products sold, rubles.

It is wrong to identify an enterprise's profit with its earnings as is frequently done in practice. The enterprise's income is a quantitative indicator, and in principle it equals the sales volume. A plant's earnings characterize only the quantitative side of its activities--the volume of goods produced and sold. In order to characterize the qualitative side

of the plant's activity it is necessary to compare these earnings with the expenditures: if earnings from product sales are greater than the costs of manufacturing the goods, the enterprise realizes a net income--the enterprise profit; if earnings are less than expenditures, the enterprise realizes a loss.

An enterprise's profit gained from the sale of its products is known as the profit on sales. However, the production-economic activity of many enterprises is not confined just to the manufacture and sale of goods. Large numbers of enterprises have within their makeup (on their books) subsidiary agricultural operations, automotive transport facilities, and other auxiliary non industrial operations. The products and services of these operations are also converted into money, but this volume of conversion is considered as other realization of a non industrial character and is not included in the enterprise's sales volume. The operations of an enterprises non industrial facilities are also structured on principles of cost accounting and provide a certain amount of profit, and, in some cases, yield a loss.

In addition, every enterprise has a certain amount of profit (or loss) from earnings and expenditures additional to sales, for example from the sale of packaging, the shipping of materials on the side, and from other operations outside of sales. For this reason, the financial result of an enterprise's production-economic activity is evaluated not in terms of profit on sales but on total profits.

By an enterprise's total profits we mean the profit obtained as a result of the activity of all industrial and non industrial operations on the enterprise's books. These total profits are known as the enterprise balance profit. By way of exception, the enterprise's balance profit excludes only the financial result of the activity of housing-utility operations. Figure 19 shows a diagram of the formation of an enterprise's balance profit.

Figure 19. Diagram of Formation of an Enterprise's Balance Profit

Балансовая прибыль предприятия (1)	=	Прибыль от реализации продукции (2)	+	Прибыль от прочей реализации (3)	+	Прибыль от внереализа- ционных доходов (4) и расходов
2866 тыс. руб. (5)		2794 тыс. руб. (6)		69 тыс. руб. (7)		3 тыс. руб. (8)
100%		97,5%		2,4%		0,1%

[Key on following page]

Key:

1. Enterprise balance profit
2. Profit on product sales
3. Profit on other realization
4. Profit on earnings and expenditures outside of sales
5. 2.866 million rubles
6. 2.794 million rubles
7. 69,000 rubles
8. 3,000 rubles

An enterprise's profit, like the enterprise itself, is a national property and is systematically utilized by the state to meet primarily the collective needs of the society. Moreover, the profit of industrial enterprises is of special significance to the state. For profit is created only in the sphere of material production: in industry, agriculture, transport, communications, construction, and trade. Among these sectors of the national economy, a leading role is played by industry, which creates more than 70 percent of this country's social product. For this reason, intra-industrial accumulations--the profit of industrial enterprises--are the state's main source of social accumulations used to develop the national economy and other national needs.

Thus, the balance profit of an enterprise is a directive indicator, and its amount for a planning year, distributed by quarters, is confirmed by the higher level organization--the Main Administration of the Ministry.

Basic trends of the utilization of profit. The national character of the enterprise's profit dictates the procedure of its utilization, which is strictly regulated.

First of all, from its profit the enterprise pays into the budget for productive capital and also pays interest to Gosbank for the use of bank credit. Payment norms for capital and interest rates for the use of bank credit are stable.

Secondly, the enterprise creates economic incentive funds. Deductions from profit into the economic incentive funds are also made in accordance with stable normatives.

The remainder of an enterprise's profit (after paying for production capital, interest payments for bank credit, and deductions into the economic incentive funds) is used for the following purposes:

to finance centralized capital investments and to liquidate credit provided for centralized capital investments;

to finance the expansion of the enterprise's own circulating assets;

to cover losses due to housing-utility operations;

for other purposes in ways and in amounts established by decisions of the Council on Ministers USSR.

The difference between the total profit and the above-listed payments and deductions is channeled by the enterprise into the budget in the form of a payment of the net profit surplus.

The distribution of the planned profit and the setting of the overall amount of payments into the budget can be illustrated by the following example.

Assume that the plant's balance profit is 2.866 million rubles (100 percent).

First of all, it is used for the following purposes:

payment for productive capital, deposited into the budget, 1.15 million rubles (about 40 percent);

payment for the use of bank credit--25,000 rubles (about one percent).

Secondly, the balance profit is channeled into the creation of economic incentive funds which amount to a total of 750,000 rubles (26 percent), including:

the material incentive fund--570,000 rubles (about 20 percent);

the social-cultural and housing construction fund--120,000 rubles (about four percent);

the productive development fund--60,000 rubles (about two percent).

Thirdly, the following are accomplished:

financing of centralized capital investments--200,000 rubles (about seven percent);

financing of the expansion of the enterprise's circulating assets--230,000 rubles (about eight percent).

In this example, a total of 2.355 million rubles of profits were distributed, amounting to about 82 percent of the balance profit. The net profit surplus subject to be paid into the budget is 511,000 rubles (2.866-2.355 million rubles) or about 18 percent.

Including the payment for productive capital (1.15 million rubles), the total amount paid into the budget is 1.661 million rubles or about 58 percent.

Thus, most of the enterprise's profit (in this case 58 percent) goes into the state budget, and the remainder (42 percent) is used by the enterprise for its own requirements.

Section 33. Profitability of Production

The concept of profitability and ways of measuring it. The absolute amount of an enterprise's profit makes it possible only in a general way to evaluate the effectiveness of its operation and to say whether it is operating at a profit, because earnings from product sales not only go to cover all outlays on production and product sales but also provide a certain amount of profit (net income).

For a more specific and objective evaluation of the effectiveness of an enterprise's operation, a relative indicator is used--profitability.

Prior to the September 1965 Plenum of the CCCPSU the indicator of profitability was determined only with respect to the prime cost of production--that is, profitability was expressed as a percentage relationship of the profit with respect to the prime cost of production (see Section 30). However, profitability with respect to plant costs also fails to provide adequate objectivity in evaluating an enterprise's effectiveness, because it only takes account of current outlays on the manufacture of the products (prime cost of production). But an evaluation of an enterprise's effectiveness cannot be confined just to a comparison of outlays and profits during a given period. It is important, after all, not just to turn out maximum production at minimal current outlays but also to make use of a minimum quantity of fixed productive capital and circulating assets. For this reason, under the new system of management implemented by decision of the September 1965 Plenum of the CCCPSU, the directive indicator established for the enterprise by the higher level organization was to be the indicator of profitability with respect to productive capital R_f . This indicator is determined by the following formula:

$$R_f = \frac{P_b}{F_o + S_o} \cdot 100 \text{ percent,} \quad (24)$$

Where P_b is the balance profit, rubles;

F_o is the average annual value of fixed productive capital, rubles;

S_o is the average annual normative of circulating assets, rubles.

For example, if the balance profit is 2.866 million rubles, the average annual value of fixed productive capital is 12.7 million rubles, and the average annual normative of circulating assets is 6.5 million rubles, then profitability with respect to productive capital will equal:

$$R_f = \frac{2866}{12,700 + 6,500} \cdot 100 = 14.8 \text{ percent.}$$

Consequently, profitability with respect to productive capital shows the amount of profit per ruble of productive capital. A 14.8 percent profitability with respect to productive capital means that the enterprise earned 14.8 kopeks in profit for each ruble of productive capital on hand.

Comparison of profit with productive capital does not mean that profit is created by the means of production. Profit is created only by the live labor of workers in the sphere of material production, in this case the workers of an industrial enterprise. But the effectiveness of labor of these workers depends on how fully and economically they use the means of production at hand. And the more effectively these assets are used the more productive will be the live labor of the enterprise's workers, the more effective the production will be overall. This is reflected not only in an absolute increase in profit but also in the amount of profit provisionally achieved for each ruble of productive capital or current outlays.

Ways of increasing profitability of production. In the first place, profitability of production can be raised through better utilization of available productive capital, which increases the volume of product sales, reduces the prime cost, and as a result leads to increased profit (the numerator in formula (24)) while maintaining unchanged the amount of utilized material assets of production (the denominator in formula (24)).

Better utilization of fixed productive capital can be achieved by the following ways:

increasing the amount of equipment operating time thanks to careful maintenance, good quality repairs, reduced losses of work time, and increased shift work;

increasing the intensiveness of operations with improved technology and better utilization of the technical capabilities of equipment on hand;

modernization of equipment and improved technical performance characteristics.

Better utilization of circulating assets also promotes increased profitability. In practice this means economizing on raw materials, supplies, fuel, and electricity, and reducing the amount of work in progress and warehouse stocks. This can be achieved by improving the design of the products manufactured, using improved technology, new and economical materials, by improving the organization of production and through rational economic incentive to the workers.

Increased profitability of production can also be achieved by putting into operation new production facilities whose economic effectiveness is higher than that achieved with the old facilities. New facilities make it possible for an enterprise to increase the volume of product sales and profit. Moreover, the high effectiveness of new facilities provides for accelerated profit growth compared with the growth of productive capital; this leads to an overall increase in production profitability.

CHAPTER 7. PRINCIPLES OF PLANNING AND ECONOMIC INCENTIVE IN SHIP-BUILDING

Section 34. Principles of Planning

The concept of planning. The country's national economy represents an interconnect complex of many sectors, tens of thousands of enterprises and organizations. This entire complex is the nation's property, and it can be successful only if it is directed by a single plan.

Systematic development of the nationaleconomy: this is one of the basic economic laws of socialism. For this reason, the main task of the organs of state administration is to use its economic-organizational activity to insure compliance with this law--that is, to insure the coordinated, systematic activity of all links of the national economy. The resolution of this task is the job of the system of planning of the national economy as a whole and its links in particular.

The basis of planning is the drawing up of plans. But planning does not involve mere compilation of plans but also the day to day work aimed at insuring plan fulfillment. For this reason, planning involves also control over fulfillment of the plan and regulation of the numerous and complicated production interrelationships between sectors, enterprises, shops, and sections.

Thus, planning is a method of utilizing the law of systematic development of the nationaleconomy, a method based on the formulation of plans, control over their implementation, and everyday regulation of the production relationships between individual links of the national economy.

Types of plans. The objects of planning are these: the national economy as a whole, sectors of industry, enterprises and their internal subdivisions (shops and sections). For this reason, depending on the objects of planning use of made of the following types of plans: the plan of development of the national economy USSR, the plans of development of sectors of industry, enterprise plans, and plant plans.

Depending on the planning period the following types of plans are distinguished: long-term forecast plans, five-year plans, annual plans, quarterly plans, and monthly plans.

Long-term forecast plans (for 10 or 20 years or more) are formulated for the basic directions of development of the national economy and the most important sectors of it. Five-year plans are formulated for the national economy and all its sectors and enterprises. Annual plans to develop and refine five-year plans are drawn up with respect to the national economy, sectors, and enterprises and also by shops. Quarterly plans are made for sectors, enterprises and shops. Monthly plans are drawn up for enterprises, shops, and sections. Shops and sections, in addition, detail a monthly plan with respect to production by ten-day periods and work days.

The planning of production in enterprises, shops, and sections for a month or shorter periods including shift and daily planning is known as operational-production planning. This type of planning is the culminating stage of all work in the formulation of a plan. This stage manifests with special strength the direct relationship between plan formulation and control over its implementation and routine (operational) regulation of productive inter-relationships.

Basic principles of planning. The planning of industrial production is accomplished on the basis of the following main principles: proportionality, continuity, scientific substantiation, and directivity.

The principle of proportionality is a key principle of planning. It requires the proportional development of sectors in the case of the plan of development of the national economy; the proportional development of enterprises in the case of sector planning, and that of shops and sections in the case of plant planning. But proportional development consists of the fact that planning provides the necessary relationships between the specific subdivisions of the national economy. For example, development of the ship-building industry is dictated by the specific requirements of maritime and river fleet operation and fishing, but at the same time it is essential to take account of the capabilities of the metallurgy industry, heavy machine building, instrument building, and other related sectors, and to plan their development appropriately. On the plant scale the principle of proportionality requires that operations be organized so that the production capabilities of every shop correspond to the capabilities of the key shop, for example the building-slip shop, so that specific plans establish the proper relationship between individual shops with respect to their volume of operations and with respect to the necessary acceleration in completion of work in accordance with technology.

The main method of providing the necessary proportionality on an economy-wide scale is the basic method. The word "balance" means the necessary correlation. For this reason, the balance method of planning involves the fact that the basic national economy requirements for material and labor

and financial resources are correlated with specific sources for meeting them by means of drawing up various balances--material, labor, and financial. As a rule, a specific balance has the form of a table consisting of two parts: available and required.

Table 8 shows the diagram of the materials balance. This diagram is used to formulate the planned materials balances with respect to the most important types of product. Data in these balances are the basis for the planning of production of these products and their distribution.

Table 8. Diagram of Materials Balance in Standard Units

№ п. п. (1)	Наличие (2)	Коли- чество (3)	№ п. п. (1)	Потребность (4)	Коли- чество (3)
1	(5) Запасы на начало го- да	10	1	(9) Производственно-эк- сплуатационные нужды	80
2	(6) Производство в теку- щем году	100	2	(10) Нужды строительства	10
3	(7) Поступление по им- порту	5	3	(11) Рыночный фонд	5
			4	(12) Экспорт	20
	(8) Итого наличие	115		(13) Итого потребность	115

Key:

1. Number in sequence
2. Available
3. Quantity
4. Required
5. Stocks as of beginning of year
6. Production during current year
7. Incoming via import
8. Total available
9. Production-operational needs
10. Construction needs
11. Marketable stocks
12. Export
13. Total required

Calculations similar to a balance is made on an enterprise-wide scale. For example, every year the enterprises draw up a manpower balance, in which it determines its available personnel by various categories and establishes its additional requirements for cadres and sources of acquiring them. Data from this balance serve as the basis for drawing up the cadre training plan within the enterprise and the plan for hiring cadres from outside.

The principle of continuity in planning represents a combination of future and current (yearly) planning. Current plans concretize the indicators of the future plan, and in some cases they revise it on the basis of current fulfillment of it. In addition, current plans take account of additional requirements coming to light as time passes, for example, during the period of fulfillment of the five year plan.

The principle of scientific substantiation means that plans must be economically substantiated and optimal (the best possible for given conditions). The basic criteria of optimality is the degree of satisfaction of the national economy's requirements for specific goods along with the greatest profitability of production.

The principle of directivity in planning means that after the necessary discussion and negotiation, the adopted plan becomes a state law and fulfilling it becomes obligatory. With respect to the plan of development of the whole national economy its directive character is expressed in the fact that it is discussed and confirmed by the Supreme Soviet USSR in the form of a Law on the State Plan for a five year period or for a specific year. With respect to individual enterprises, directivity in planning is expressed in the fact that the higher level organ--the Main Administration of the Ministry--confirms the most important indicators of their production-economic activity, which in practice have come to be known as directive indicators.

The list of directive indicators is approved by the government of the Soviet Union and includes nine indicators which embrace the most important aspects of activity of enterprises in the field of goods production, labor, finances, capital construction, and the adoption of new equipment. All remaining technical-economic indicators are used only to calculate and substantiate directive indicators and are approved by the enterprise director. In daily operation these indicators are known as calculation indicators.

Section 35. Production Program as the Fundamental Part of an Enterprise's Plan and Methods of Measuring It

The enterprise plan and the significance of its component part--the production program. The production-economic activity of an enterprise is complex and multi faceted. It incorporates several phases of activity, including: direct production of goods; equipment and production technology; capital construction; material-technical supplies; organization of labor and wages; financial activity; organization of material incentive, socialist competition, and so on. For this reason the overall plan of the production-economic activity of an enterprise consists of many sections, each of which embraces one of the phases of its activity. The overall plan of activity of an enterprise for a year is known as the technical, industrial, and financial plan, and detailed discussion of its content will be found in a separate chapter.

The basic purpose of any enterprise is the production of a specific product. For this reason, the plan with respect to product production, known as the enterprise's production program, is the basic section of its technical, industrial, and financial plan. All remaining sections are of subsidiary importance and are aimed at providing the necessary conditions for the production of the goods in accordance with the production program. Moreover, providing the necessary conditions entails organizing the work so that with rational utilization of the equipment and new technology it is possible to fulfill the production program with minimum outlays of labor, materials, and financial resources.

Indicators of the production program and measurements of them. The production program of an enterprise is its elaborated (detailed) plan with respect to goods production. This plan in simplified form represents a list of the goods to be manufactured with an indication of the quantity of each type.

The list of goods to be manufactured is known as the production program projects list. The amount of goods to be turned out (each type and overall) by an enterprise is known as the product volume.

The product volume of an enterprise is measured in physical and value terms. Physical measures of product volume are items, sets, tons, cubic meters, and so on. In ship-building, considering the lengthy cycle of ship construction, which not only goes beyond the bounds of a month or quarter but also in many cases beyond the bounds of a year, use is also made of specific physical measurements: the percent of technical readiness of a ship and advancement of the technical readiness of the ship during a specific period. For example, as of 1 January 1970 the technical readiness of a specific ship was 30 percent, and in 1970 the ship was to be delivered over to the client (at 100 percent readiness). In this case the advancement of technical readiness in 1970 is 70 percent (the difference between 100 and 30 percent).

However, in physical measurement it is only possible to express the volume of homogeneous (single-type) goods. But as a rule any enterprise turns out products of many kinds. For example, a ship-building plant builds vessels simultaneously in accordance with several plans, manufactures dozens of kinds of machine building parts in MSCh [presumed expansion modified gray iron] shops and sends them to other plants via inter-plant cooperation, and turns out several kinds of consumer items and other goods. These variegated items can be combined to determine the product volume for the plant as a whole only by measuring them in terms of value. This value measurement of product volume is accomplished via wholesale prices for each type of product. In practice, for such purposes use is made of two kinds of prices: wholesale prices effective during a given year and constant (comparable) prices. The latter type is essential in order to compare product volume for a number of years and to determine its movement. This movement will correctly reflect the actual state of affairs only if the product volume is evaluated for comparable years and in comparable units of measurement--that is, in constant (comparable) prices.

First price-list prices are used as comparable prices for machine building products. For each new type of machine as it is put into production a temporary price is first set--for the first batch of machines, for example 10,000 per rubles per machine; after that the list price (the wholesale price drawn up in the list of prices), for example 9,000 rubles. If this type of machine continues to be manufactured for several years then the price is revised downward and relisted in the amount, for example, of 8,000 rubles. In this case, after the second price list goes into effect the effective price for the sale of the machine will be 8,000 rubles and the comparable price will be 9,000 rubles (the price in accordance with the first list).

For ships, the comparable price used is the weighted average approximate price of the first series ships. For example, in 1971 the construction of a series of new ships was begun. In addition to the prototype that year work was begun on the construction of three series ships with an approximate price of 10, 9, and 8 million rubles each, with advancement of technical readiness of 30, 20 and 10 percent, respectively. From this the weighted average price of the first series ships will be:

$$\frac{(10 \cdot 0.30) + (9 \cdot 0.20) + (8 \cdot 0.10)}{30+20+10} \cdot 100 = \frac{5.6}{60} \cdot 100 = 9.33 \text{ million rubles.}$$

From the preceding it is well known (see Section 19) that each item manufactured at an enterprise goes through two stages: the production stage and the sales stage. During the first stage it goes through the main shops of the enterprise and takes the form of work in progress (parts, assemblies, sections, ships in building slip, fitting-out, and undergoing tests). At the end of the production stage the item is converted into a finished product and is turned over to the sales warehouse to be shipped to the client. After that comes the sales stage: the item is forwarded to the client, the client accepts it and pays for it. The sales stage is considered completed the day the money to pay for the manufactured item comes into the account of the manufacturing enterprise.

In ship-building the product sale process is simplified. Construction of the ship is checked by client representatives at all stages of production. By the time the tests are completed the crew arrives at the ship building plant; the crew takes over the ship and sails it to the base and operations location. For this reason, the ship is considered ready on the day that the acceptance deed is signed, and that same day is considered the day of the ship's sale.

Thus, in the process of production-economic activity any product takes sequentially the form of work in progress, finished product, and sold product. In accordance with this the product volume of every enterprise is evaluated not via a single indicator but rather a group of interconnected indicators each of which reflects the product volume in some form or other corresponding to the individual stage of production or sale.

In industry there are the following types of product volume: volume of product sale, commercial product, work in progress, and gross product.

The volume of product sale represents the volume of finished goods which are not only sent to the clients but also paid for by them, the money for which goes into the account of the manufacturing enterprise. The volume of product sale is evaluated in effective prices.

Commercial product is the name given to the volume of finished product accepted by the division of technical control and turned over to the sales warehouse for sale to the customers. Commercial goods are evaluated in effective and comparable prices.

Work in progress represents uncompleted manufactured goods in various stages of production in the form of parts, assemblies, and items, also in the stage of assembly and testing. Work in progress, evaluated in physical measure (items, sets, and so on) is known as stocks (stocks of parts, assemblies, sections, and so on).

Gross product is the name given to the overall product volume physically produced by the enterprise without regard to the degree of readiness. Gross product in machine building is determined in terms of commercial product with the addition of the value of the gain (with a plus sign) or loss (with the minus sign) of the work in progress. The formula for calculating the gross product is as follows:

$$P_v = P_t + (P_n^k - P_n^n), \quad (25)$$

where P_v is the gross product in terms of comparable prices, rubles;

P_t is the commercial product in terms of comparable prices, rubles;

P_n^k is the work in progress as of the end of the planning period in terms of comparable prices, rubles;

P_n^n is the same as of the beginning of the planning period, rubles;

$(P_n^k - P_n^n)$ is the change in the work in progress during the planning period (gain or loss), rubles.

For example, say that the machine building shops of a ship building plant manufactured five control actuators in January according to the MZK plan and turned them over to the sales warehouse. The effective wholesale price per machine is 3,200 rubles and the comparable price is 3,500 rubles. Work in progress for these machine amounted to 9,300 rubles as of 1 January and 10,500 rubles as of 1 February.

The plant's commercial product with respect to control actuators during January will equal:

ineffective prices: $5 \cdot 3,200 = 16,000$ rubles;

incomparable prices: $5 \cdot 3,500 = 17,500$ rubles.

Gross production with respect to these machines will be different in value than commercial production, because during the month the work in progress has changed--it has gained. From this the amount of gross production will be:

$$P_v = 17,500 + (10,500 - 9,300) = 18,700 \text{ rubles.}$$

In order to simplify the calculation of gross product it has been determined that a change in work in progress is considered only with respect to goods the production cycle of which exceeds two months. For all other goods the volume of gross product is taken to be equal to the volume of commercial product.

In ship building the volume of gross production with respect to ships under construction is measured by the percentage of advancement of their technical readiness during the planning period. For example, if the comparable price of the ship is 8.375 million rubles and the advancement of its technical readiness during the year is 70 percent (for example, from 30 to 100 percent), then the gross production with respect to that ship during the year will equal

$$\frac{8375 \cdot 70}{100} = 5.863 \text{ million rubles.}$$

The technical readiness of every ship as of the beginning and the end of each planning period is determined on the basis of a complex system of planning-accounting units used for in-plant planning and accounting of ship construction. The maintenance and application of this system is discussed in subsequent sections of the course.

Section 36. Indicator of Production Volume

The concept of production volume and its distinction from product volume. Let us recall once more that the process of production represents a constant interaction of three components: labor, means of labor, and objects of labor. Labor and means of labor constitute the active and, basically, constant components of production. These components find concrete expression in the number of working personnel, in the amount of fixed productive capital used by them, and the consumption of fuel and all kinds of energy. As for the objects of labor, they constitute the passive elements of production with a continuously changing physical content, which is subjected to processing by enterprise workers using the means of labor.

The objects of labor (materials and sets of items) come to the enterprise from outside; they are subjected to all processing stages and at the end of the technological process, in a new form--the form of the finished product--they again leave the plant, while the enterprise personnel and the means of labor remain in place, continuing to work on the "processing" of newly-arriving objects of labor.

The product volume is determined in terms of the full value (price), which includes outlays on all components of production including outlays on the objects of labor. For it is wrong to speak of product volume without considering the amount and cost of materials and sets of items that go into it. Production volume, on the other hand, is quite another indicator. It reflects just the amount of the work done by the enterprise workers in processing the objects of labor and, consequently, does not include the cost of the objects of labor--the materials and sets of items.

Measurements of production volume. In simplified form, production volume involves labor outlays of production workers or the full labor outlays of all enterprise workers. These outlays per unit of product and for all the enterprise's production can be determined in terms of the labor-intensiveness of the work, in terms of the wages paid to production workers, or all the wages paid to industrial-production personnel. Moreover, each of these measurements must have normative significance with respect to the unit of production. For example, the normative labor-intensiveness of building a dry-cargo ship is 1.16 million norm-hours, but in actuality the labor-intensiveness of the construction can be more or less than the normative. To this normative labor-intensiveness corresponds the normative wages paid to production workers in the amount of 610,000 rubles.

However, workers in an enterprise engaged in production do not process the objects of labor using nothing but their bare hands but rather by means of and through the use of the means of labor. The degree to which production is provided with the means of labor, their technical level, and the amount of labor outlays, constitute interconnected values: the higher the level of equipment the less labor-intensive the work is, and vice versa. For this reason, the production volume in terms of full measurement involves outlays of labor and the means of labor incurred in the "processing" of the objects of labor. The amount of these active outlays is determined in terms of the normative cost of processing (NSO).

The amount of the NSO of an item is determined by subtracting from its wholesale price material outlays and other direct expenditures as well as the normative profit. For example, if the wholesale price of a ship is 8.365 million rubles, including 1.674 million rubles in materials, 2.701 million rubles in contract agent deliveries, 400,000 rubles in contract agent work, 428,000 in special and other direct expenditures, 67,000 rubles in non productive expenditures, and 1.082 million rubles of normative profit, then the NSO for the given ship will equal:

$8,365 - 1,674 - 2,701 - 400 - 428 - 67 - 1,082 = 2,013$ thousand rubles

Thus, the NSO of a ship in the amount of 2.013 million rubles includes outlays on the following calculation items: wages paid to production workers and ship and all-plant overheads.

If we break down NSO by economic outlay components then we can see that it includes outlays of labor and means of labor. Labor outlays are expressed in the form of wages paid to production workers as well as wages paid to the other categories of workers and deductions for social security which are included in the shop and all-plant overheads. Outlays of the means of labor are expressed in the form of amortization deductions and outlays for fuel, electricity, and auxiliary materials which are included in shop and all-plant overheads.

Measurement of production volume in terms of NSO is widely used in a number of industrial sectors, including light industry, ship repair, and so on. Experience in the use of this measurement has also been accumulated in individual plants of the ship building industry. However, in machine building--including ship-building, the normative labor-intensiveness of items is most widely used for measuring production volume.

Conditions for the use of the indicator of production volume. In addition to indicators of product volume (gross, commercial, and sold goods) the indicator of production volume is officially planned and taken into account only by enterprises which use the NSO to measure it. In other sectors the role of the indicator of production volume is provisionally played by gross production. But in many cases, gross production distorts the actual state of affairs with respect to the volume of work done and labor productivity, and it becomes necessary to make additional calculations to determine the production volume measured in terms of labor (with respect to the labor-intensiveness of manufactured items).

Gross production can be provisionally used as the indicator of production volume only in enterprises which during the course of many years turn out one and the same product with approximately the same specific value (share) of the cost of objects of labor (automotive, tractor, bearing, and similar plants). If, however, the goods being produced are different in kind and their products list changes frequently, then gross production is not even provisionally capable of reflecting production volume and labor productivity. The reason for this is the varying materials-intensiveness of the manufactured items, by which we mean the share of the cost of the objects of labor in the price of each type of product. For example, in a ship-building plant several different types of ships may be under construction at the same time; in addition, the plant may be manufacturing items for inter-plant cooperation, consumer goods and so on. Some ships may require costly hull steel and many complex contract agent deliveries. In the price of these ships the share of the cost of the objects of labor runs as high as 70 percent or more. Such goods are materials-intensive and "advantageous" because producing them insures large product volumes with relatively low labor outlays.

Other ships, for example river vessels, require ordinary hull steel and not so large a quantity of contract agent equipment, because conditions governing their operation are simpler. For this reason, in the price of these ships the share of the cost of the objects of labor declines to between 45 and 50 percent. Such goods are more labor-intensive, and achieving the same product volume as in the case of the first type of ships requires the outlay of considerably more labor on the part of the plant collective.

The relationship between material-intensive and labor-intensive goods changes every year, and for this reason gross production cannot reflect the actual dynamics of the volume of work performed by the enterprise itself and the labor productivity of the personnel. It reflects on the dynamics of the product volume, which includes the value of the processed objects of labor. Under such conditions the indicator of production volume in the form of the labor-intensiveness of the production program, while not official, is of great significance for the objective planning of production and analyzing its results.

By way of example let us examine the following simplified case.

Let us assume that a ship-building plant is building two types of ships of approximately the same displacement but designated for different purposes. The hull of some of the ships (plan A) is made of ordinary steel, while the hull of the other (plan B) is made of higher-quality steel, for example grade 10KhSND. The hulls of both types of ships require 2,500 tons of metal each. One ton of ordinary steel, for example, grade 4S, costs 120 rubles, while 10KhSND steel costs 160 rubles. The labor intensiveness of processing the metal for each ship is approximately the same, about 29,000 norm-hours.

The shop prime cost of processing the metal for one ship of each plan in the hull shop is given in Table 9.

Table 9. Shop Prime Cost of Processing Metal for One Ship in the Hull Shop

№ п. п. (1)	Статьи цеховой калькуляции (2)	Единица измерения (3)	Количество или величина (4)		Стоимость единицы, руб. (7)		Цеховая себестоимость, руб. (8)	
			Проект А (5)	Проект Б (6)	Проект А (5)	Проект Б (6)	Проект А (5)	Проект Б (6)
1	(9) Материал	(14) т	2 500	2 500	120	160	300 000	400 000
2	(10) Трудоемкость	(15) нормо-час	29 000	29 000	—	—	—	—
3	(11) Средняя тарифная ставка 1 нормо-час	(16) руб.	0,48	0,48	—	—	—	—
4	(12) Основная заработная плата производственных рабочих	»	13 920	13 920	—	—	13 920	13 920
5	(13) Цеховые расходы	% (16) руб.	380 52 896	380 52 896	— —	— —	— 52 896	— 52 896
(17) Итого цеховая себестоимость			—	—	—	—	366 816	466 816
(18) Округленно			—	—	—	—	367 000	467 000

[Key on following page]

Key:

1. Number in sequence
2. Items of shop calculation
3. Unit of measurement
4. Quantity or amount
5. Plan A
6. Plan B
7. Cost of unit, rubles
8. Shop prime cost, rubles
9. Material
10. Labor-intensiveness
11. Average wage rate per norm-hour
12. Basic wages paid to production workers
13. Shop expenditures
14. Tons
15. Norm-hours
16. Rubles
17. Total shop prime cost
18. Rounded off

The hull shop processes the metal in batches for two ships at the same time, with a batch cycle of one month. For this reason, every month the shop routinely completes a volume of work for two ships first of one and then the other plan. For example, in March the shop turns out two sets of processed metal for ships of plan A, characterized by the following indicators with respect to production:

product volume (gross production) $2 \cdot 367,000 = 734,000$ rubles;

production volume (labor intensiveness of program) $2 \cdot 29,000 = 58,000$ norm-hours.

In April, turning out two sets of processed metal for ships of plan B, these indicators will be:

product volume-- $2 \cdot 467,000 = 934,000$ rubles;

production volume-- $2 \cdot 29,000 = 58,000$ norm-hours.

We see that in April the product volume, including the cost of the articles of labor rose substantially (934,000 rubles as against 734,000 in March). Going by this indicator alone it would be possible to conclude that the shop collective was successful, having achieved a substantial rise in production:

$$\frac{934-734}{734} \cdot 100 = 27 \text{ percent.}$$

However, the indicator of production volume serves as a corrective to this conclusion. The volume of the work done by the shop did not rise, because

the labor intensiveness of the program of both months is the same (58,000 norm-hours), and the rise in the product volume that occurred in April is the result of product-list changes in the make-up of the shop's production: instead of ships of plan A the shop worked on ships of plan B, the materials-intensiveness of which is considerably larger because of the use of more costly steel.

This pattern of comparison calculation of the indicators of product volume and production volume, as has been mentioned, is based on a simplified case. In practice everything is more complicated: the products list is considerably longer, the complex of work done by the shop on a single ship does not end in one month, and so on. However, this pattern is in principle correct for any case and the difference lies only in the quantity and form of the calculations to be done.

Section 37. Commercial Output as a Specific Production Indicator of a Ship-Building Plant

The concept of commercial output. Although ship-building is a special sector of machine building, it has much in common with it in terms of the economics, organization, and planning or production processes. At the same time the specific nature of ship building gives rise to many differences in this sphere. One such difference involves the conditions of the construction and sale of the ships, which has led to the necessity of using a completely different indicator in ship-building, to be used only in ship-building plants and in installation enterprises handling on-board electrical and radio equipment. The necessity of this specific indicator--commercial output--is the result of the following conditions.

As a rule, the manufacture of most machinery is carried out independently, without any connection to a specific client. Finished machinery is turned over to the sales warehouse, and only before being shipped from the enterprise do the sales division personnel assign the machinery to the clients. The client in such cases checks out the machinery only after receiving it and pays for it after that. The need for financial resources during the manufacturing process is met by means of circulating assets of the machine building shop.

The situation is different with ship construction. Every ship has a specific client from the very first day of construction. The client's representative is always present in the ship-building plant and takes active part in its construction through intermediate control of the quality of the completion of the most crucial operations. At the same time, the client checks on the completeness and the completion time tables of the basic operations involved in the ship's construction in accordance with the agreed-on contract.

The construction cycle of medium sized and large sized vessels is measured in many months and even years. The wholesale price of the ships amounts to hundreds of thousands and million of rubles. Judging by this, ship-building plants would have to have enormous circulating assets and the clients of the ships would have to have very large amounts of funds in their accounts in order to pay for the ships at the time of delivery. However, in connection with the specific conditions of ship-building the following procedure has been established: simultaneously with the intermediate checking of the construction progress the client pays part of the wholesale price to the ship-building plant. By the time the ship is delivered to the client, as a rule, about 90 percent of the cost has already been paid to the plant. After delivery of the ship, the plant incorporates it at full value in its commercial output and sales volume but it receives from the client during that month only the remainder of the cost--that is, about 10 percent. Consequently, the sales volume of the ship-building plant, in contrast to all other enterprises, does not reflect the amount of incoming funds received in the form of earnings from the sale (disposal) of its goods. But without an indicator reflecting the receipt of monetary funds it is impossible to plan the financial activity of the ship-building plant. In order to eliminate the developing gap between the sale of the product and the receipt of funds, a specific indicator is operative in ship-building plants--commercial output.

The volume of commercial output of a ship-building plant consists of two parts: the amount of intermediate payments to its account made by the clients with respect to partial readiness of ships under construction, and the sales volume with respect to the remainder of the product.

Thus, the commercial output of a ship-building plant during a particular period of time, characterized the volume of intermediate work (accepted and paid for by the clients) on the construction of ships and the sales volume with respect to the remainder of its product.

Payment stages and payments tables. Payment for the construction of ships with respect to partial readiness is made on the basis of what are known as payment stages, the essence of which consists of the following.

At all stages of ship construction (billet, block, building slip, fitting-out, and testing) we delineate basic operations the completion of which characterizes particular physical readiness of the ship, for example: processing of the metal of the hull, assembly and welding of the bottom sections, assembly of a specific block, testing of the hull for sealing, and so on. Every group of such operations is known as a payment stage, and as they are completed the client pays the plant an amount of the total cost of the ship as previously agreed on. Recently, increasingly widespread use has been made of a new principle of establishing payment stages--on the basis of shop-stages: every payment corresponds to a particular shop-stage or group of small shop-stages.

The payment table is the name given to an approved list of payment stages, with indication of the specific value (share) of each of them as a percentage of the wholesale price of the ship. For example, if the payment stage "Testing of the Ship's Hull for Sealing" has the specific value five percent, and the wholesale price of the ship is 8.375 million rubles, then after the testing of the hull is completed the client pays to the plant:

$$\frac{8375 \cdot 5}{100} = 420,000 \text{ rubles.}$$

The percentage-wise rather than the absolute expression of the amount of the payment stage is due to the fact that the payment table, as a rule, is established for an entire series of ships of a single plan, with the exception of the prototype, while the wholesale price of the ships gradually goes down (by groups of ships) as their number in sequence goes higher.

The specific value of each payment stage is determined proportionately to the labor-intensiveness of the complex of operations encompassed by the given stage. The number of payment stages depends on the size and complexity of the ship and on the length of time necessary to build it, and ranges between 10 and 100.

Payment tables are established only for ships costing more than 50,000 rubles per unit.

Section 38. The Production Capacity of an Enterprise as the Starting Base for Calculating its Production Program

The concept of the production capacity of an enterprise. By production capacity of an enterprise we mean the maximum possible output of goods in the course of a year under conditions of full utilization of equipment and production areas using advanced technology, organization of production and labor, and elimination of "bottlenecks."

The production capacity of an enterprise is determined by the capacity of its key shops. For a ship-building plant such shops are the hull-processing shop, the assembly and welding shop, and the building slip shop. In determining capacity it may turn out that some shops and sections have smaller capacity than the key shops. Subdivisions which limit the full utilization of the capacities of the key shops are known as bottlenecks. Despite their existence, their throughput is not taken into account--that is, the enterprise's capacity is determined by the capacity of the key shops. At the same time, measures are worked out to eliminate bottlenecks.

An enterprise's production capacity is determined in units of items as well as in rubles of gross product. At the same time, considering the lengthy

cycle of ship construction, the capacity of a ship-building plant as a rule is expressed in fractions of ships of a single plan. For example, if the capacity of a plant building dry cargo ships is 6.7 units, this means that in the course of a year it may build six ships and have a project start for a seventh ship in the amount of 70 percent of readiness.

Principles of calculating production capacity. A cardinal factor in calculating production capacity is determination of the initial data:

the product list and its labor-intensiveness;

the composition and quantity of existing equipment and assembly areas;

the work regime and the actual available work time deriving from it.

Let us examine the content of these initial data and the use of them for calculating production capacity.

An enterprise's production capacity is figured on the specific product list of the output. And if the make-up of the product changes or it remains constant but the specific value of its components changes, then the enterprise's capacity also must be refigured based on the new product (the new specific value), its labor-intensiveness, and conditions of manufacturing, including conditions of the workload of the individual shops. This workload is not uniform and depends on the characteristics of the items being produced. For example, if a ship-building plant has built tankers and converts to the manufacture of refrigeration ships of approximately the same displacement, then the workload of the individual shops will change substantially. For example, the workload on the hull shop may decrease by about 1.5 times while that of the painting-insulation and wood working shops may increase by two times. These changes in workload will be the result of a changed structure of operations in ship construction, which, in turn, derives from the design-technological characteristics of each type of ship.

The labor-intensiveness of operations in a shop or section with respect to each type of product is established on the basis of technological-norming documents. The overall labor-intensiveness of ship construction as a whole (figured for purposes of calculating capacity) should not exceed the norm of labor-intensiveness established for the series ship that is in production. For example, if the plant builds the first ships of a series with a labor-intensiveness of 1.2 million norm-hours each, while the production ship is considered the tenth one with a labor-intensiveness of 960,000 norm-hours, then calculation of the plant-capacity with respect to these ships is made based on 960,000 norm-hours of labor-intensiveness. In this way, labor-intensiveness in the shops decreases and in this case constitutes 0.8 of the labor intensiveness of the first ships--that is, the coefficient 0.8 takes account of the reduced labor-intensiveness from 1.2 million to 960,000 norm-hours.

In the calculation of capacity, labor intensiveness must be expressed in man-hours. For this reason, labor-intensiveness in norm-hours is recomputed to labor-intensiveness in man hours on the basis of progressive-average fulfillment of existing norms. To serve as the progressive-average fulfillment of norms we take the level of fulfillment achieved by a group of the best workers, the number of which constitutes 20 to 25 percent of all workers in a given trade. For example, 40 men are working in the welding section; the average norm fulfillment is 125 percent. However, 12 welders are fulfilling norms of 130 to 135 percent. For this reason, we take the progressive-average norm fulfillment to be 133 percent.

Recomputation to labor-intensiveness in man-hours T_{m-h} is made according to the following formula:

$$T_{m-h} = \frac{T_{n-h}}{K_n} \cdot 100, \quad (26)$$

where T_{n-h} is the labor-intensiveness, norm hours;

K_n is the progressive-average percentage of fulfillment of existing norms.

For example, if the labor-intensiveness of construction of a series production ship is 960,000 norm hours and the progressive-average percentage of norm fulfillment is 130, then

$$T_{m-h} = \frac{960}{130} \cdot 100 = 740,000 \text{ man-hours.}$$

The make-up and amount of existing equipment in calculating capacity is determined by the actual available equipment at a given time within the basic shops without regard to whether the equipment is in operation or idle because of repairs or other reasons. The capacity of the hull shop, for example, is determined by the throughput of the key equipment: straightening and bending machines, gas cutting machines, guillotine shears, and so on.

The assembly areas that are taken account of in calculating capacity are the production areas involved in assembly, regulation, and painting of components, set-packaging platforms, and canting areas. The size of the production areas is used to determine the capacity of the assembly-welding shop.

Equipment and areas of the auxiliary shops are not taken into account in figuring capacity.

In calculating capacity, the two-shift regime of operations is taken. On this basis we determine the actual annual available work time T_d . The amount of this time is measured in hours and is determined as follows:

$$T_d = (260 \cdot 2 \cdot \frac{41}{5} - 6) \cdot 0.96 = 4,088 \text{ hours.} \quad (27)$$

where 260 is the rounded number of work days for any year of calculation;

2 is the number of shifts;

$\frac{41}{5}$ is the average length of a work shift, hours, based on five working days and 41 hours of work per week;

6 is the overall decrease in work time during pre-celebration days, hours;

0.96 is the coefficient which takes account of the decrease in work time in connection with equipment repairs.

By way of example we present below the extended calculation of the throughput (capacity) of the gas cutting section of a hull shop.

Initial data:

a) the product list and its labor-intensiveness:

ships of plan A and B; labor-intensiveness of gas cutting operations of a single ship of plan A--5,700 norm hours, plan B--5,900 norm hours;

specific value (share) of ships of each plan in the production volume is respectively 60 and 40 percent;

progressive-average level of norm fulfillment 135 percent;

b) the gas cutting equipment comprises 15 units, serviced by 23 workers in each shift--that is, one unit of equipment is serviced by an average of 1.5 workers;

c) the effective available work time figured on the basis of 2-shift operations comes to 4,088 hours.

The extended calculation of the throughput is figured this way:

1) the labor-intensiveness of gas cutting operations in norm hours is recomputed to labor-intensiveness in man-hours:

for ships of plan A

$$T_{m-h} = \frac{5,700}{135} \cdot 100 = 4,230 \text{ man-hours};$$

for ships of plan B

$$T_{m-h} = \frac{5,900}{135} \cdot 100 = 4,380 \text{ man-hours};$$

2) the labor-intensiveness of one ship is determined in machine-hourse based on labor-intensiveness in man-hours and the number of workers servicing a unit of equipment:

for ships of plan A

$$T_{mc-h} = \frac{4,230}{1.5} = 2,820 \text{ machine-hours};$$

for ships of plan B

$$T_{mc-h} = \frac{4,380}{1.5} = 2,930 \text{ machine hours};$$

3) we find the effective annual available work time of all the section's equipment:

$$T_d = 15 \cdot 4,088 = 61,320 \text{ machine-hours};$$

4) we determine the amount of machine hours necessary for work on ships of each plan, based on their given specific value (share) in the production volume:

for ships of plan A

$$T = \frac{61,320}{100} \cdot 60 = 36,790 \text{ machine-hours};$$

for ships of plan B

$$T = \frac{61,320}{100} \cdot 40 = 24,530 \text{ machine-hours};$$

5) we determine the throughput (capacity M) of the section:

for ships of plan A

$$M = \frac{T}{T_{mc-h}} = \frac{36,790}{2,820} = 13 \text{ units};$$

for ships of plan B

$$M = \frac{24,530}{2,930} = 8.4 \text{ units}.$$

Thus, with a given ratio between ships of the two plans in the overall production volume (60 and 40 percent) the gas cutting section in terms of its capacity can provide for the construction of 13 ships of plan A and 8.4 ships of plan B.

Methods and economic effectiveness of improving the utilization of production capacities. The production capacity of an enterprise is the basis for the planning of production, its amount indicating the maximum possible production program for the planning year. However, in drawing up the actual

plan it is necessary to come to terms with the actual possibilities of production which, as a rule, compel us to reduce the plan somewhat in comparison with existing capacities. There are many reasons for such discrepancies, but the main ones among them are these: an inadequate number of workers, which makes it impossible to organize double-shift operations; shortcomings in the technology and organization of production compared with the level used to figure capacity; the presence of bottlenecks in production; the lack of essential material resources; and so on. In connection with this, the task of making maximum use of capacities and finding realistic ways to do this is one of the most urgent and economically vital problems of the production-economic activity of any enterprise.

The basic ways to improve the utilization of production capacities are these:

reducing to a minimum planned idleness of equipment and assembly areas;

elimination of unplanned idleness;

disallowance of instances of unproductive work;

detection and elimination of bottlenecks.

Reducing planned idleness to a minimum can be achieved by increasing shift work and increasing the number of workers, also by reducing the amount of equipment repair time by careful maintenance of it and better organization of repair operations.

Elimination of unplanned idleness requires efforts against shift losses due to so called organization-technical failures (lack of materials, parts, tools, power outages, equipment breakdown, and so).

Elimination of unproductive work means eliminating defective products, reducing allowances, providing supplies and tools in accordance with the formulated technological process, reducing to a minimum additional work in connection with changes in product design, and so on.

The economic effectiveness under conditions of better utilization of production capacities is determined as follows:

By an increase in production output;

by reduced prime cost per unit of product in connection with the fact that increasing production output leads to reduced provisional-constant expenditures per unit of product;

by increased profit in connection with increased production output and reduced prime cost per unit;

by increased profitability of production, since an increase in profit is achieved without increasing the enterprise's fixed capital.

Section 39. Basic Principles of Economic Incentive to Raise the Effectiveness of Enterprise Operations

Principles of economic incentive. Increasing the effectiveness of industrial enterprise operations is an objective necessity, because it alone can insure the necessary material conditions for strengthening the economic power of our country and improving the workers' well being.

Several vital economic indicators serve as criteria for increasing the effectiveness of enterprise operations: they arise in the product sales volume, achieved primarily through increased labor productivity; an increase in the amount of earned profit; better utilization of existing productive capital.

In seeking to resolve this vital national economy task a major role is played by the system of economic incentive, primarily the system of material incentive to enterprise workers. In connection with this the September 1965 Plenum of the CCCPSU made a decision to upgrade the role of economic incentives and to make it possible for enterprises to raise wages paid to their workers not so much from the wage fund as from their own profit, but only under conditions of a steady rise in the effectiveness of enterprise operations.

In accordance with this decision, enterprises are given a portion of their profit to be used for material incentives to the workers, for implementing social-cultural measures and housing construction, and also for further developing production.

These funds come to the enterprise in the form of deductions from profit into three economic incentive funds: the material incentive fund, the social-cultural measures and housing construction fund, and the production development fund.

The procedure of deductions from profit into economic incentive funds. When approving the five-year plan for the enterprise, the higher-level organization simultaneously establishes the amount of each economic incentive fund. In determining the amount of the funds it takes account of the intensiveness of the five-year plan, the necessity of accelerated growth of labor productivity compared to the rise in average wages, the proportion of engineering-technical personnel and employees in the overall number of enterprise workers, the complexity of the product being produced, the value of the fixed productive capital, and a number of other factors.

The size of the economic incentive funds specified in the five-year plan for a specific year is placed at the disposal of the enterprise only if it submits for approval a current plan for this year with respect to sales volume (for ship-building plants, with respect to commercial output), with respect to profitability level and labor productivity, and also with respect to the proportion of top category goods in the overall production volume, in full accordance with the five-year plan target for that year.

If the enterprise submits an increased or a reduced plan, then deductions into the economic incentive funds will be accordingly increased or reduced. Increasing or reducing deductions into the economic incentive funds compared to their level in accordance with the five-year plan is implemented in accordance with normatives approved by the higher level organization.

Normatives for changing deductions into the economic incentive funds are established as follows:

for each percentage of change in the increase of sales volume compared to the increase of this indicator in the five-year plan;

for every percentage point of change in the overall profitability with respect to the funds compared to the level specified in the five-year plan;

for every percentage of change in the increase of labor productivity compared to the increase in accordance to the five-year plan.

For example, an enterprise's five-year plan specifies that in 1973 it should have a material incentive fund in the amount of 900,000 rubles. Moreover the basic indicators of its operations for that year in accordance with the five-year plan have the following values: product sales volume--58 million rubles, corresponding to eight percent of the increase of this indicator compared to the report volume for 1970; level of overall profitability--16 percent; labor productivity--7,000 rubles per worker with a seven percent increase over 1970.

Let us assume that normatives for a change in deductions, approved for the enterprise, have the following values:

with respect to sales volume--0.5 percent of the wage fund of the base year of 1970 for each percentage of change in the increase of this indicator compared with the increase in accordance with the five-year plan;

with respect to the profitability level--0.4 percent of the wage fund of the base year for each point of change of this indicator;

with respect to labor productivity--0.3 percent of the wage fund of the base year for each percentage of change in its increase.

Under such conditions the enterprise is economically motivated to submit for the planning year a maximally intensive plan which takes account of the use of all reserves and capacities. Let us assume that for the enterprise the current plan for 1973 has been approved with the following values of the basic indicators:

sales volume--59 million rubles as against an initial 58 million rubles; this corresponds to 9.7 percent increase as against an initial 8 percent;

profitability level--17.5 percent;

labor productivity--6,930 rubles per worker as against an initial 7,000 rubles per worker; this corresponds to a six percent increase as against an initial seven percent. The total wage fund of the enterprise in the base year is 9.5 million rubles.

Having adopted an increased plan for 1973 with respect to sales volume and profitability, the enterprise receives funds additional to 900,000 rubles for the material incentive fund F_{mi} as follows:

1) for increasing the sales volume by 1 million rubles.

$$\Delta F_{mi} = \frac{1.7 \cdot 0.5 \cdot 9,500}{100} = 80,750, \quad (28)$$

where 1.7 is the increase in the rise in sales volume for 1973 from 8 to 9.7 percent;

0.5 is the normative of change in deductions, percent;

9,500 is the total wage fund of the enterprise during the base year, thousands of rubles;

2) for increasing the profitability level:

$$\Delta F_{mi} = \frac{1.5 \cdot 0.4 \cdot 9,500}{100} = 57,000, \quad (29)$$

where 1.5 is the increase in profitability level for 1973 from 16 to 17.5 percent;

0.4 is the normative of change in deductions, percent.

The rise in labor productivity has declined by one percent compared with the 1973 five-year plan target. In connection with this the material incentive fund must be decreased as follows:

$$\Delta F_{mi} = \frac{(-1) \cdot 0.3 \cdot 9,500}{100} = -28,500 \text{ rubles}, \quad (30)$$

where -1 is the decrease in the rise of labor productivity from 7 to 6 percent;

0.3 is the normative of change of deductions, percent.

The revised planned material incentive fund of the enterprise for 1973 in accordance with the indicators of the current plan will be:

$$900 + 80.75 + 57 - 28.5 = 1,009,250 \text{ rubles.}$$

The material incentive fund will also increase additionally (or decrease) for each percentage of overage (or decline) in the proportion of goods of top category quality in the overall production volume of the planning year compared with the values specified by the five-year plan. The procedure of implementing these measurements is formulated and approved by the

Ministry in coordination with the central committee of the sector's trade union as certification of the product in the sector is completed.

Annual revision of the other economic incentive funds is accomplished in similar fashion.

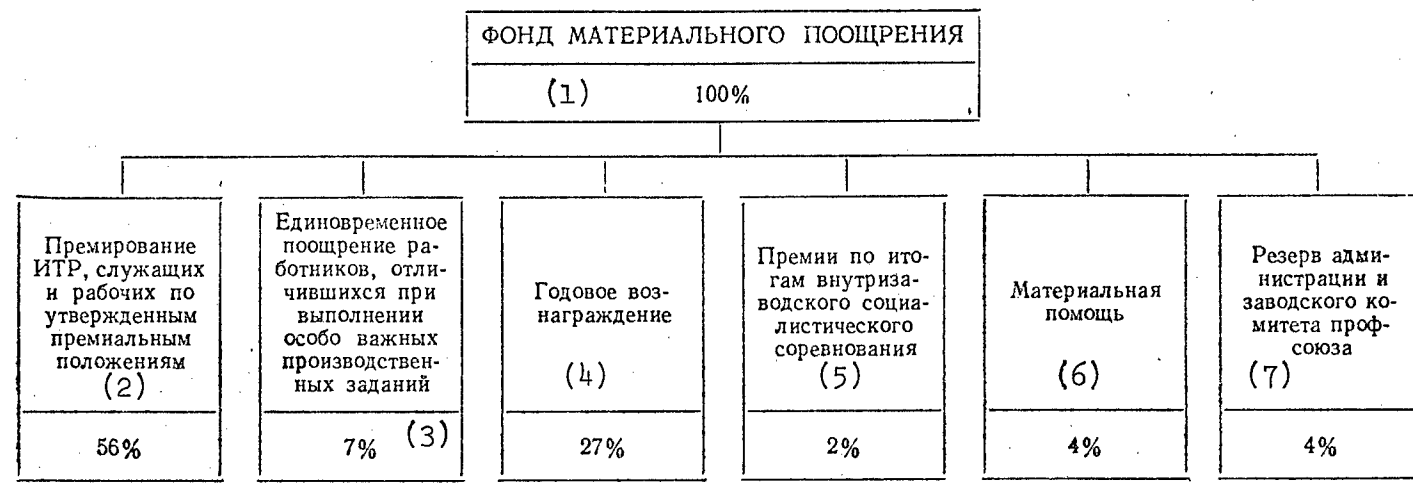
The revised annual plan with respect to economic incentive funds is distributed by quarters proportionally to the quarterly wage funds.

Actual deductions from profit into the economic incentive funds are made quarterly as the plan is fulfilled: if the plan with respect to sales volume, labor productivity, and profitability is over fulfilled, additional deductions are made provided that the profit plan is also over fulfilled and the above-plan profit is the source of such additional deductions; if the plan is not fulfilled with respect to these indicators, also the plan with respect to the most important types of goods, deductions into the funds are reduced. Additional deductions or reduced deductions into the economic incentive funds are made in accordance with the percentage of over fulfillment (under fulfillment) of the plan using approved normatives.

The above procedure of deductions from profit into the economic incentive funds is used for all industrial enterprises in the country. Because of the specific nature of their operations, for ship building plants this procedure is changed somewhat, as follows: deductions into the funds are made not in accordance with the sales volume indicator but in accordance with the commercial output volume.

Directions in the use of economic incentive funds. The use of the material incentive fund is examined in Section 26. To supplement this, Figure 20 shows the diagram of utilization of this fund with respect to individual directions, reflecting the experience of one of the ship-building plants.

Figure 20. Diagram of Utilization of Material Incentive Fund



Key:

1. Material incentive fund
2. Bonuses to engineering-technical personnel, employees, and workers in accordance with approved bonus regulations
3. One-time incentive payment to personnel who have distinguished themselves in the fulfillment of especially vital production targets
4. Annual remuneration
5. Bonuses for the results of in-plant socialist competition
6. Material aid
7. Administration and plant trade union committee reserve

The social-cultural measures and housing construction fund is used as follows:

to improve the cultural-amenity and medical service provided to enterprise workers;

for the construction, expansion and capital repairs to housing, clubs, vacation homes, sanatoria, dining facilities, sports facilities, and other cultural-amenity facilities.

Distribution of funds from this fund along these lines is made by the enterprise administration in collaboration with the trade union organization.

The procedure for the use of the production development fund is examined in Section 17.

CHAPTER VIII. COST ACCOUNTING AS A METHOD OF PLANNED MANAGEMENT OF THE SOCIALIST ENTERPRISE AND ITS SUBDIVISIONS

Section 40. Basic Principles of Cost Accounting in an Enterprise

The concept of cost accounting. The operation of an enterprise under cost accounting conditions means that it must carry out its production-economic activity in such a fashion that all expenditures on the production of its goods are covered through earnings from the sale of the goods and, in addition, it is to make a certain profit--that is, to operate at a profit (profitably).

The end goal of cost accounting--its main task--is to have the enterprise operate at a profit. To handle this task, every cost-accounting enterprise must have implemented specific steps in the technology, organization, planning, and economics of production in order to assure regimes of economy, high labor productivity, and fulfillment of state plans with the least outlays of labor, materials, and monetary resources. Among these measures, great importance attaches to the rational system of material and morale incentive to enterprise workers and the organization of effective socialist competition.

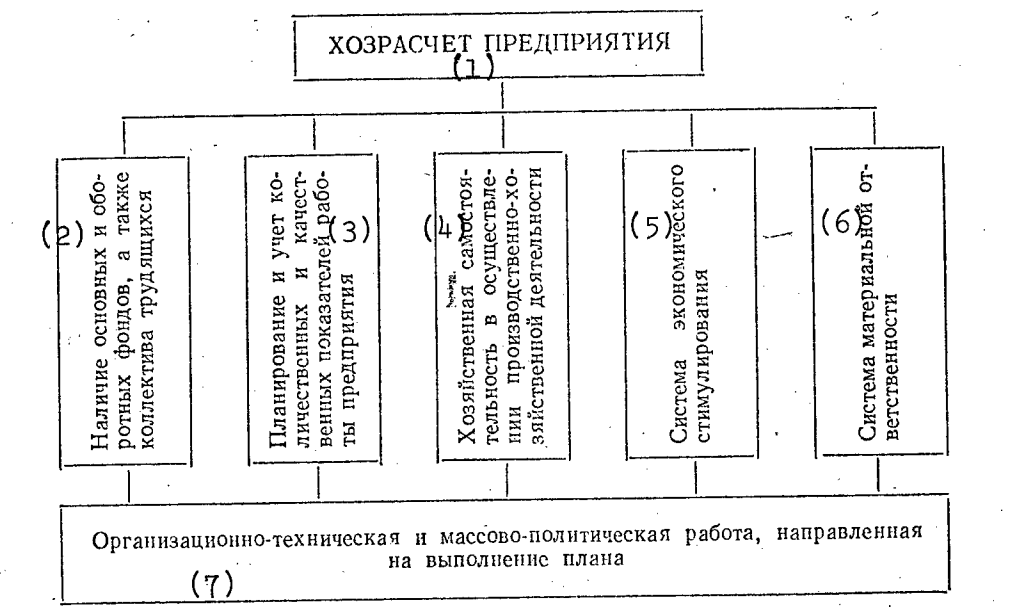
Thus, cost accounting is a method of planned management of the socialist enterprise, based on an economic approach to production administration which requires rational conduct of business by covering outlays for the manufacture of the goods through earnings gained from the sale of the goods and the use of such economic categories as money, price, profit, profitability, material responsibility, and material incentive.

Without the organization of the enterprise's work on the basis of cost accounting it is impossible to assure rational business practices, it is impossible to win in the economic competition with capitalism. For this reason, the task of organizing socialist cost accounting was the order of the day during the very first years of the building of socialism. V.I. Lenin pointed out that building socialism and leading millions of people to

communism can be done (not on the basis of enthusiasm directly but rather by means of enthusiasm born of the great revolution, on the basis of individual example, on individual motivation, on cost accounting.) (V.I. Lenin, "On the Fourth Anniversary of the October Revolution," "Collected Works," Volume 33, p.36).

The content of enterprise cost accounting. Enterprise cost accounting can be represented in the form of a diagram showing the basic components of it (Figure 21).

Figure 21. Diagram of Cost Accounting



Key:

1. Enterprise cost accounting
2. Presence of fixed and circulating capital as well as a collective or workers
3. Planning and accounting of quantitative and qualitative indicators of enterprise operations
4. Economic independence in carrying out production-business activity
5. System of economic incentive
6. System of material responsibility
7. Organizational-technical and mass-political work aimed at plan fulfillment

The presence of fixed and circulating capital as well as a collective of workers is the basic factor in any production-business activity determining the existence of a viable enterprise. In order for the enterprise to be able to operate on cost accounting, what is needed primarily is to establish a plan which states clearly: what products the enterprise is to produce and in what quantity, what outlays should be made to produce the goods and what financial result the enterprise should end up with-- that is, the amount of profit and the profitability. But the planning

of the enterprise's activity is indissolubly linked to accounting, because only by means of well organized accounting is it possible to determine the degree of plan fulfillment.

The planning and accounting of an enterprise's activity under cost accounting is supported by its economic independence in every day operations. This independence of the enterprise must provide for the most rational resolution of the entire complex of production and business problems and issues dictated by the production activity within the framework of the state plan. The economic independence of an enterprise is expressed primarily by the fact that it is a legal entity having the right to conclude business contracts with other enterprises and organizations and to hire and fire personnel; it has its own charter, independent balance sheet, and accounts in Gosbank; it has the right to formulate and approve abroad range of technical-economic indicators for its work.

The above listed rights are just the basic ones, determining the independent activity of cost-accounting enterprises. A more extensive exposition of the rights of enterprises is given in Section 5.

Of the main rights of enterprises, special importance for the organization of cost accounting attaches to the enterprise's right to conclude business contracts which serve as the main tool in implementing cost accounting. It is business contracts which formulate and specify the mutual obligations of cost-accounting enterprises and organizations, including: the content of contractual relationships (product delivery, performance of particular work or services, and so on), the fulfillment time table, technical specifications, the price per unit of goods, the total amount of the contract, the accounts procedure, and so on.

Enterprise cost accounting will be effective only if its components of planning, accounting, and economic independence include specifications on economic incentive and material responsibility for the results of the work. The system of economic incentives is examined in Section 39. The material responsibility of the enterprise is expressed by the fact that for violation of business contracts it pays penalties, and in the event of non fulfillment of the plan with respect to the most important indicators there is a corresponding decrease in deductions from profit into the economic incentive funds; consequently bonuses to be paid out are reduced sharply, and many workers are completely deprived of the right to receive bonuses. Individual categories of workers, moreover, bear personal liability for the results of their work both in terms of administrative and legal procedures.

The conduct of cost accounting by the above listed components, supported by the everyday organizational-technical and mass-political work of the enterprise's administration and its party and social organizations, aimed at fulfillment of the state plan, represents a method of enterprise management which provides for profitability.

Section 41. Principles of Organization of In-Plant Cost Accounting

The necessity and possibility of organizing in-plant cost accounting. The effective operation of a cost-accounting enterprise can be insured only if the basic principles of cost accounting of enterprises are brought down to the subdivision--the shops and sections. For it is the shops and production sections which carry out the main production processes, and no one knows the reserves of production and ways to utilize them as well as the shop workers, primarily the shop and section chiefs, crew leaders, and workers.

In-plant cost accounting is shop and section cost accounting based largely on the same principles as enterprise cost accounting; it has its own distinctive features which are expressed in simpler organizational forms of implementation.

Shops and sections, being subdivisions of an enterprise, jointly take part in a single production process. None of the goods they turn out constitute a product ready to be sold; they are merely semi finished products which become finished goods as a result of the total operations of all of the enterprise subdivisions in accordance with the established technology. For this reason, shops and sections cannot function as full-fledged cost-accounting units; they do not need to conclude business contracts, to have accounts in Gosbank, to purchase raw materials and supplies, to sell their goods, and so on.

However, every shop and section has its own technological or subject specialty and a specific task within the overall production process. From this derives the possibility and the necessity of assigning to each enterprise subdivision the task of achieving the best possible results with the least outlays. The content and the method of the conduct of in-plant cost accounting with respect to each subdivision must derive from the specific tasks and objective conditions of operations of the shop and section. This cannot be a stereotyped pattern. The plant, shop, section--all are various links in production, having a common task, but the task is varied in terms of scale, complexity and the means of implementing it. For this reason, that which is good and necessary for the plant cost accounting is by no means totally suitable for the shop cost accounting, and that which is necessary and possible for the shop cannot be applied to the section or the crew. And the basic approach to the organization of in-plant cost accounting consists of the fact that the simpler the link in production (plant, shop, section), its tasks and means of implementation, the simpler and more accessible its cost accounting must be.

The basic components of shop cost accounting. Proceeding on the basis of the above principles, shop cost accounting--the shop being the basic subdivision of the enterprise--must include the following components:

fixed capital and personnel collective assigned to the shop;

planning and accounting of the basic operational indicators of the shop with respect to production, labor, and prime cost;

the system of material incentive;

the system of material responsibility;

clearly delineated rights and duties of the shop management, formulated in the "Statute on the Cost-Accounting Shop" ;

organizational-mass work for purposes of mobilizing the collective to fulfill and over fulfill the plan.

These components taken in their everyday interaction constitute shop cost accounting.

Basic measures determining the organization and effectiveness of in-plant cost accounting at a ship-building plant. The organization of in-plant cost accounting--especially the planning of indicators of shop operations with respect to production, labor, and prime cost--requires serious technical preparation:

the assignment of specific operations to each shop (specialization of shops);

formulation of a system of planning-accounting units to serve as the basis of the planning of shop indicators with respect to production and prime cost of the goods and implementation of the accounting of their fulfillment;

formulation of the necessary norms and normatives to serve as the basis for the measuring of the production of goods and determination of the necessary amount of labor and material outlays.

Without this technical preparation it is impossible to plan and keep account of the work of the shop, and without this there can be no cost accounting.

These components of the technical preparation of in-plant cost accounting are common to any industrial enterprise but conditions governing their implementation are not uniform for the enterprises of various sectors: the more complex the goods and the process of production the more complex is the implementation of the required technical preparation for organizing in-plant cost accounting.

Especially complex is the organization of in-plant cost-accounting in ship building, because the exceptional complexity of ships, the lengthy construction cycle, and the small-series character of the production create additional difficulties in this regard. A basic problem in the organization of in-plant cost accounting in ship-building is the approach to the creation of the planning-accounting units of ship construction. The character of the resolution of this problem determines the degree of

effectiveness of the everyday work with respect to the planning and accounting of the work of each shop, and, consequently, the possibility of organization and the effectiveness of its cost accounting. The system of the planning-accounting units of ship construction, in connection with its complexity and cardinal importance, is dealt with in Section 51 of this course.

In addition to the described technical preparation, the adoption and refinement of in-plant cost accounting requires the fulfillment of a number of other measures:

the outfitting of all shops with control-measurement equipment for the autonomous accounting of production outlays;

streamlined storage and issuance of materials, tools, accessories, and so on;

assured conditions for the reliable accounting of all outlays via a system of bookkeeping with respect to the adopted planning-accounting units of the prime cost of the goods;

the imposition of order and the formulation of constructive changes in shop output so that these changes are appropriately reflected in the planning and accounting of the shop's indicators with respect to production and prime cost;

formulation of a system of in-plant sanctions for cases where shops violate their obligations with respect to inter-shop cooperation, and establishment of procedures for applying them;

formulation of a system of material incentive for shop workers for the results of their cost-accounting activity.

Section cost accounting is a component of the overall system of in-plant cost accounting and organic continuation of shop cost accounting.

The operating conditions of a section differ from those of a shop as follows: the section has less routine independence in production and business matters; its tasks are simpler and its capabilities are limited. In connection with this, compared with shop cost accounting section cost accounting must be simpler in form, corresponding to its tasks and capabilities. Despite the relative simplicity, however, section cost accounting must nevertheless include all the basic components which constitute the basis: the planning and accounting of technical-economic indicators; material motivation; and material responsibility.

The relative simplicity of section cost accounting is expressed in the smaller number of technical-economic indicators, in the allowance of planning and accounting of prime cost not for all but for individual types

of outlays--accounting not just by means of the bookkeeping system but also through the use of operational accounting. Extreme simplicity and specificity must characterize the system of material incentive for section workers as well.

The above elucidated content of cost accounting shows that it is not a particular matter of economics and organization of production but rather represents an integrated system of business practice and administration.

Technical, economic, and organizational components of cost accounting, when used properly, make it possible to achieve the end goal of effective management--maximum output of goods at minimal outlays.

All the preceeding chapters of the text have made it possible to reveal the purpose and the basic content of cost accounting; all subsequent chapters present a detailed specification of the basic components of cost accounting of a ship-building plant, its shops, and its sections.

PART TWO. ORGANIZATION AND ECONOMICS OF TECHNICAL PREPARATION AND TECHNICAL
CONTROL OF PRODUCTION IN SHIP-BUILDING

CHAPTER 9. PRINCIPLES OF TECHNICAL PREPARATION OF PRODUCTION

Section 42. Tasks and Content of Technical Preparation of Production

The concept of technical preparation of production and its tasks. Before beginning the construction of ships of a new type it is essential to carry out considerable technical work: research, design, technology, and a number of other preparatory measures. The complex of such work preceding the beginning of work on the construction of a new ship (the manufacture of a new machine) is known as the technical preparation of production. Technical preparation is a continuous process by means of which we ensure the adoption of new manufactured items and technical processes in production and improved designs and technology of manufacture of items already in production (old ones). The main task of technical preparation of production is to implement technical progress in production for purposes of boosting its effectiveness and profitability.

The content of technical preparation of production. Technical preparation of production consists of six parts:

- 1) design preparation of production;
- 2) technological preparation of production;
- 3) material-technical preparation of production;
- 4) capital construction and remodeling of the plant;
- 5) organizational-technical measures;
- 6) cadre training.

The basic content of design preparation of production is the planning of new manufactured items and improvements to those already in production. The result of design preparation should be to provide the plant with design blueprint documentation: drawings, technical conditions, specifications, order lists for materials and sets of items, and so on.

CHAPTER XIV. ORGANIZATION AND PLANNING OF SERVICE FACILITIES (REPAIR, WAREHOUSING, AND TRANSPORT)

Section 61. Organization and Planning of Repair Facilities

The tasks of repair facilities. An enterprise's repair facilities have the job of organizing the rational operation of the equipment, buildings, and structures, of implementing repairs, and also modernizing the equipment. The smooth and routine operation of the repair facilities largely determine the labor productivity of production workers and the effectiveness of equipment utilization. Enterprises which have lagging repair facilities incur greater losses in connection with the frequent malfunctioning of equipment; this leads to worker idleness and additional outlays for repairs. Under such conditions, equipment modernization is not accomplished in sufficient volume; there are oversights in repairs to buildings and structures, and labor productivity therefore cannot rise as it should. Among the objects serviced by the repair facility, special importance for production attaches to the active portion of fixed capital: equipment, machinery, and mechanisms. Maintaining these facilities in good working order is a high-priority task of the repair service, and its main efforts and resources are channeled into this.

The structure of the repair facility. An enterprise's repair facility includes the chief mechanic's division and a mechanical repair shop subordinate to it; large enterprises also have a construction repair shop. In addition, an enterprise's repair facility also includes shop repair services, which include shop mechanics and repair mechanic crews who work under the direction of these mechanics. Shop mechanics are administratively subordinate to the shop chief and functionally subordinate to the plant's chief mechanic.

The overall direction of the repair facility is in the hands of the enterprise's chief engineer.

Types of repair work. In terms of its character and volume, all repair work is divided into the following types:

minor repair--replacement or restoration of a small number of worn out parts and the regulation of equipment without disassembly;

medium repairs--the replacement or restoration of a considerable number of worn out parts and the regulation of equipment with partial disassembly;

capital repair--replacement or restoration of all worn out parts and regulation of the equipment with full disassembly.

In carrying out medium and capital repair, in many cases, the equipment is modernized at the same time--that is, a number of design changes are made in the equipment to make it possible to improve performance.

Methods of equipment repair. In carrying out repairs, there is the constant task of completing the work as rapidly and efficiently as possible in order to reduce the amount of enforced equipment idleness. In connection with this, the workers of the repair facility make extensive use of the most advanced methods of repairs: assembly, sequential-assembly, and production line.

In the assembly method, repairs are made by replacing the assemblies which need to be repaired with new assemblies which have been made available for this purpose beforehand. This method is used chiefly to repair equipment in short supply, for example bridge cranes, hydraulic presses and so on.

The sequential-assembly method of repair consists of repairing assemblies not all at the same time but sequentially. This kind of repair, as a rule, is done during non working time--on holidays or on the second or third shift. This method of repair practically never removes the equipment from operation.

The production line method of repair calls for doing the repair work at specialized work places, thus providing considerable labor productivity of the repair personnel and reduced repair periods. In ship building this method is used rarely, because it can be accomplished only when repairing a large amount of equipment of the same type.

The system of planned-preventive repair. The repair facility can handle its assigned task most efficiently when equipment is maintained and repaired in accordance with a definite, previously-established procedure (system). The necessary procedure in repair work is established by the system of planned preventive repair (PPR). This system represents a plan formulated beforehand with respect to equipment maintenance, service, and repair. The PPR system has been successfully used for many years in ship building plants.

The system of planned-preventive repair includes the following:

current maintenance (between repairs);

periodic preventive maintenance--change of oil, washing, checking for precision, and so on;

planned repairs--minor, medium, and capital.

The basic essence of the PPR system involves systematic preventive work to guard against breakdown and malfunctioning of the equipment. When PPR is correctly implemented, unplanned repairs and malfunctions do not occur as a rule.

In large plants, planned-preventive repairs are chiefly carried out by the shop repair services. In this case the mechanical repair shop carries out only capital repair on especially complex and critical equipment, and it also manufactures and replaces spare parts. On smaller plants, on the other hand, all work on PPR is accomplished by mechanical repair shop forces.

Normatives for the organization and planning of repair work. The PPR system is in practice implemented on the basis of annual, quarterly, and monthly plans, which specify all the types of repair work and the time schedules. In drawing up these plans, use is made of special normatives which establish the sequence and the dates of implementation of preventive maintenance and repair work for various kinds of equipment, also the labor-intensiveness and the materials necessary for it.

For the organization of PPR, normatives are worked out for the following basic indicators:

the length of the repair cycle;

the structure of the repair cycle;

the labor intensiveness of the work;

the materials-intensiveness of the work (materials requirements).

The repair cycle refers to the time between two capital repair operations completed in sequence. The normative of the length of the repair cycle for every kind of equipment establishes the specific length of time; for example, for bridge carrains operating in dock yard shops this normative is five years when operations are conducted in two shifts and 10.5 years when operations are conducted in one shift.

Throughout the repair cycle inspections are made, also minor and medium equipment repairs. The makeup and sequence of these inspections and repairs constitute the structure of the repair cycle. This structure is also established in accordance with normatives for every kind of equipment. For example, for bridge carrains the following structure of the repair cycle is established:

K-O-O-O-O-M₁-O-O-O-O-M₂-O-O-O-O-M₃-O-O-O-O-M₄-O-O-O-O-M₅-O-O-O-O-M₆-O-O-O-O-M₇-O-O-O-O-M₈-O-O-O-O-K.

This structure of the repair cycle indicates that in the interval between the capital repairs K there are eight minor repairs M and 36 inspections O; medium repairs S are not done.

The length of time between individual kinds of repairs and inspections is also determined by normatives. For example, for bridge carrains the lengt of the period between repairs when operations are conducted in two shifts is 5.5 months for minor repairs; the time span between inspections is one month.

With a specific set of equipment in a section, in a shop, and in the whole plant, and also the above normatives of the length of the repair cycle and its structure, it is possible to begin to formulate a plan of PPR and equipment inspection. These normatives make it possible to determine what repairs and inspections need to be carried out for each kind of equipment during the course of a year, including each month. But in order to complete this plan it is also necessary to know the labor intensiveness and materials intensiveness of the repair work. These data are also established in accordance with normatives worked out beforehand for each type of equipment.

Normatives of labor intensiveness and materials intensiveness are established depending on the complexity and the size of the equipment: the more complex and bulky the machine tools or other equipment, the more difficult it is to repair them--that is, the greater the labor intensiveness involved in the repair and the materials requirement. On this basis, for each type of equipment we establish the category of complexity involved in its repair and the normatives of labor intensiveness of material intensiveness (in accordance with data of standard regulations concerning PPR).

The planning of repair work. The basis for planning repair work is the chart of PPR drawn up using normatives governing the length of the repair cycle and its structure. This chart gives the name of the equipment to be repaired, the types of repairs and inspections, the number, and the time of implementation. Normatives of labor intensiveness and materials intensiveness are used to determine the overall labor intensiveness and the cost of the repair work.

In the plan of the mechanical repair shop the total volume of repair work is distributed as follows:

- capital and medium repairs;
- minor (current) repairs;
- current inspection (service);
- manufacture of spare parts for repairs.

In the plans of the repair shops these operations are the basic ones, but in addition a number of other operations are specified, including: equipment modernization, manufacture of custom equipment, and so on. The plan also obligatorily maintains a reserve of time for carrying out emergency work.

Increasing the effectiveness of repairs. Repair effectiveness is expressed primarily by the quality and the completion timetable of all operations specified by the PPR chart.

The quality of the repair work, completion of them on schedule, and reducing the amount of time necessary to a considerable extent depend on the organization of such efforts and the level of technical preparation, as well as the direct organization of their implementation.

It is possible to improve the technical preparation of repair operations by setting up a full set of drawings and diagrams for each type of equipment and developing advanced technological processes of manufacturing spare parts and assemblies and carrying out the repair work. Improved organization of repair operations is accomplished by timely and complete provision of replacement assemblies and parts, materials, and tools for the repair work. Also yielding substantial effect is the organization of repair work in accordance with the assembly and sequential-assembly method.

Section 62. Organization of the Material-Technical Supply Service and the Warehouse Facility

The tasks of the material-technical supply service and warehouse facility. The functions of the material-technical supply service include providing the basic and auxiliary production operations with all necessary materials, fuel, purchased items, and sets of equipment. The storage of these material assets from the moment of their arrival at the enterprise until they are put into production (turned over to the shops and sections) is provided in the warehouse facility, which is a part of the material-technical supply service.

The main tasks of the material-technical supply service include the systematic and continuous provision of the enterprise with the necessary deliveries and storage of them until they are put into the production process, also compliance with established norms of material assets on hand. In fulfilling these tasks, the material technical supply service must make every effort to reduce as much as possible outlays involved in the delivery of material assets (transport-procurement expenditures) and the storage of them.

The structure of the material-technical supply service. The management of the enterprise's material technical supply is accomplished by the deputy director for general affairs. The direct operations involved in material technical supply are the job of two plant management divisions: OMTSS [material technical supply and sales division], and OVK [external cooperation division].

The OMTSS plans and implements the receipt, storage, and issuance of materials, fuel, and minor purchase items. Under its direct jurisdiction is the central warehouse with its staff of auxiliary workers and employees.

Deliveries of sets of ship equipment are planned and implemented by the OVK, with a ship's equipment warehouse having the necessary staff under its jurisdiction. In some plants, the central warehouse and the ship's equipment warehouse are directly subordinate to the deputy director.

Norms and normatives of material technical supply. The providing of the necessary materials and sets of equipment for production is accomplished on the basis of norms and normatives.

Norms of material technical supply per unit of product are formulated by the plant's technological service (see Section 52). In accordance with these norms of materials consumption as well as in accordance with lists of sets of equipment, in consideration of the production program, the material supply service determines the plant's annual requirements in objects of labor.

The plant's annual requirements for objects of labor are met throughout the course of the year through the repeated receipt of deliveries from manufacturing enterprises (suppliers). During this process of regular supplies of the necessary materials and equipment for production, the material technical supply service handles a double task. First, in order to provide continuous supplies of materials to the shops it insures necessary stocks of materials in the warehouses. Supply workers are objectively interested in increasing warehouse stocks through what are known as reserve stocks. Secondly, when materials and equipment sit for a long time in the warehouses, the plant's circulating assets are tied up and their turnover rate is slowed down; this can seriously hamper the plant's financial activity. For this reason, the amount of warehouse stocks must be optimal--that is, sufficient for normal supply to the shops and at the same time minimal in order to avoid tying up circulating assets.

For this reason, in order to establish the necessary amount of warehouse reserves, use is made of reserve norms--that is, minimum amounts of materials and sets of equipment stored in the plant's warehouses but sufficient for normal shop supply. Reserve norms, in days, are established for each type of material asset. In calculating them, account is taken of the average daily consumption of each material, how far away the supplier is located, the shipment transit norm, for example, a car, and so on. Reserve norms of materials and sets of equipment are established by OMTSS and OVK with the participation of technologists, planners, and workers in the plant finance division.

On the basis of reserve norms, for each type of material asset, a cost normative is set, and warehouse stocks must remain within this normative. This value is known as the normative of circulating assets for the given type of material. For sheet steel, for example, with a reserve norm of 90 days, this normative may be 237,000 rubles (see Section 19).

Reserve norms must in their aggregate provide a volume of material assets in warehouses which remains within the established normative of circulating assets.

Classification and indexing of materials and ship's equipment. In machine building, especially ship building, use is made of an enormous products list of materials and sets of equipment, running as high as several tens of thousands of items (articles and standard sizes). Under such conditions, in order to impose order on the planning of material technical supply, materials and equipment storage, and accounting for them it is necessary to have a precise system of classification and indexing of material assets.

Classification and indexing of materials are analogous in operation to the system which was elucidated above with respect to tools. All materials and equipment are also classified by sections, groups, subgroups, and so on, for example: section "ferrous metals," group--"structural steel," and so on; indexing is accomplished by the decimal system.

A systematic list of materials and equipment is drawn up in the form of a products price list, in which all materials are listed in the order of their classification along with their index for each item, the standard or technical specification number, and the price.

Organization of systematic supply of materials and sets of equipment for production. Systematic material technical supply for production is accomplished by a large collective of workers, and it includes the following basic elements:

the planning of material technical supplies;

routine work involved in providing materials and sets of equipment for production;

control over proper consumption of material assets.

The planning of material technical supply is examined in Section 68. The stage of planning of material technical supply ends with the conclusion of contracts with the suppliers to receive materials and sets of equipment in accordance with allocated funds. In recent years, widespread use has been made of what are known as direct contacts with suppliers. These direct contacts consist of the fact that large ship building plants acquire permanent suppliers in advance--several years in advance--for the most massive materials, for example, structural steel. Allocation of funds in such cases continues in the conventional procedure but the supplier remains the same.

Routine work on material-technical supply for production consists of the fact that workers of OMTSS and OVK control the fulfillment of contracts for the delivery of materials and, in case of difficulties, take necessary measures. Workers of the warehouse facility provide storage and accounting of materials and, in accordance with shop norms (limits) issue them to the shops. The

issuance of materials above the established norm can be done only by means of special documents and with the consent of the plant managers, consent which is given after the reasons for the over consumption are explained.

Materials from the plant's warehouses are not directly issued to the work places but rather to the shop (intermediate) stores, which are under the jurisdiction of the shop's PRB [plan-distribution bureau]. The storage of materials in these stores, the procedure of issuing them to the work places, and the designated utilization are constantly controlled by workers of the plant's material technical service.

Organization of the warehouse facility. The basis of the warehouse facility comprises material technical supply warehouses: the central department warehouse (the main store), specialized warehouses for steel, lumber, fuel, and so on, and a warehouse for sets of equipment. In addition to these warehouses, the warehouse facility includes production warehouses for semi finished products, parts, and assemblies (subordinated to the production-dispatcher division), and a finished products warehouse.

The work of the warehouses consists of receiving, storing, accounting, and issuing materials, equipment, and other objects. In addition, the finished products warehouse packs items and ships them to clients in accordance with contracts.

Ship building plants make use of three types of warehouses: open, semi enclosed, and enclosed. Open warehouses are equipped warehouse plant forms for storing oversized and massivematerials which do not require protection from precipitation, for example warehouses of steel, raw lumber, and timber. Semi enclosed warehouses are roofs over plant forms, which are sometimes boarded up on three sides. Enclosed warehouses are deigned to store the most valuable materials and equipment. As a rule, railroad spurs or roads lead up to the warehouses.

Methods of storing material assets depend on their properties. Generally, warehouses are equipped with a variety of types of stowage such as shelving, boxes, cages, herringbone, and overhang. There is also special stowage for keeping sheet steel, provided with upright posts, and so on.

In the warehouses, materials are stored in accordance with their type and grade and firmly assigned to specific places. In order to simplify the search for materials, every stowage or other storage place has its own index. The warehouse man keeps a special records book which contains a list of all stored materials along with the index of their place of storage.

Overall, in materials storage the following must be insured: safeguarding of the materials both in terms of quality and quantity; free access to all materials for purposes of convenient receiving and issuance; most rational utilization and issuance; most rational utilization of area and warehouse space.

In a number of ship building plants the warehouses have procurement departments designed for preliminary preparation of the materials and equipment prior to being issued for production. For example, steel cleaning and straightening sections for ships' hulls are frequently included in the steel warehouse; ship's warehouses have sections engaged in degreasing machinery and equipment.

The organization of operations of plant warehouses with respect to the issuance of material assets to the shops depending on the type of operation is implemented either according to the passive or active system.

In the passive system, shops themselves receive necessary material from the warehouse on the basis of limit lists or one-time materials requisitions. The delivery of materials to the shop is also accomplished by shop workers. This form of shop supply is used in the unit and small-series construction of ships.

Active material supply to the shops calls for delivering them to the shop in accordance with plan-charts drawn beforehand by warehouse facility personnel. This form of in-plant supply can be organized only in large-series shop construction.

Section 63. Organization and Planning of In-Plant Transport

Types of in-plant transport and its technical means. In-plant transport is of two types: inter-shop and in-shop. Inter-shop transport is designed to move freight between shops, and between shops and warehouses. Inter-shop transport is accomplished by the facilities and manpower of the transport shop, which has the necessary transport means: railroad platforms and cars, diesel locomotives, railroad and floating carriages, trucks, tugs, barges, motor boats, and so on.

Large plants generally have two transport shops: overland and water transport. The latter is often known as the captain's part of the plant.

In-shop transport provides transport operations within the shop and is managed by shop personnel. These operations are performed by electric and truck cars, trolleys, and hand cars. In-shop transport facilities also include bridge carriages. A number of operations in in-shop transport are also accomplished by means of trucks and rail devices provided to the shops by the transport shop in accordance with previous request orders.

Charts of freight flows and their calculation. The organization of in-plant transport is based on charts of freight flows and the volume of freight turnover.

By freight flow we refer to the amount of freight carried between two points over a given period. The number of individual freight flows represents the total freight turnover during the period (day, month, or year).

The freight flow chart represents a simplified master plan of the plant, which indicates graphically the directions and amounts of all freight flows (Figure 28). The amount of each freight flow is expressed in the width of the plotted lines drawn to a certain scale based on the volume of the freight that is carried.

The amount of each freight flow in a year is determined by multiplying the production program of each shop (see below) by the consumption norm (per unit of product) of materials or received parts, assemblies, and sets of equipment, expressed in tons.

In addition to the amount of each freight flow and the freight turnover as a whole it is also necessary to know the maximum daily average amount of freight turnover G_{d-a} , which is determined in accordance with the following formula:

$$G_{d-a} = K_{if} \cdot \frac{G_g}{D_r} \quad \text{tons,} \quad (40)$$

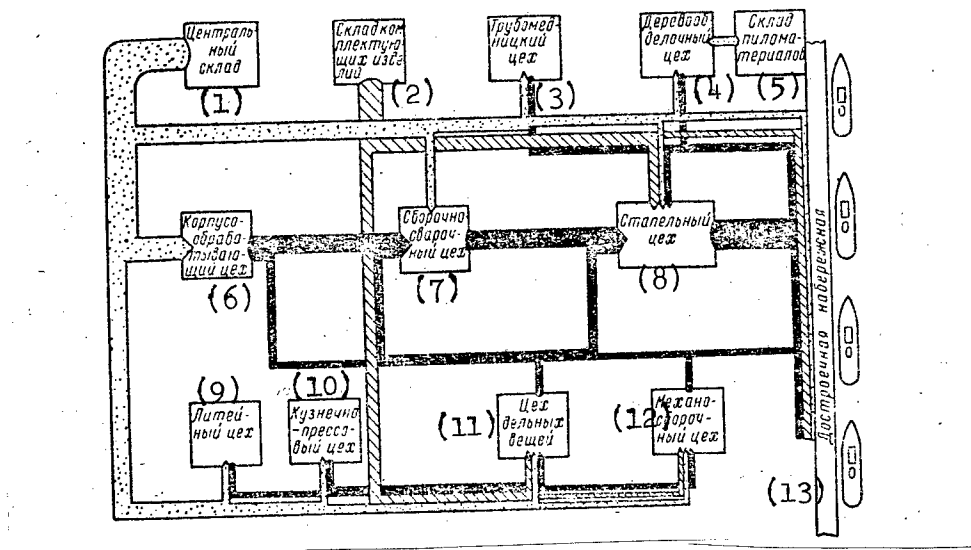
where K_{if} is the coefficient which takes account of the irregularity of freight turnover, the value of which for in-plant shipping is taken to be 1.5;

G_g is the annual freight turnover, tons;

D_r is the number of working days in the year.

The amount of maximum daily average freight turnover is used in calculating the required amount of transport facilities.

Figure 28. Chart of Freight Flow at Ship Building Plant



Legend:

- | | | |
|------|--|-------------------------------|
| a -- | | flow of materials; |
| b -- | | flow of sets of items; |
| c -- | | flow of intershop deliveries. |

Key:

1. Central warehouse
2. Warehouse of sets of items
3. Pipefitting shop
4. Woodworking shop
5. Lumber warehouse
6. Hull shop
7. Assembly-welding shop
8. Building slip shop
9. Casting shop
10. Press-forge shop
11. Deck fittings shop
12. Mechanical assembly shop
13. Fitting-out pier

The selection and accounting of required transport means. The selection of transport means is accomplished for each shop individually based on the specific conditions of production and a number of other requirements.

The first requirement is that the means of transport must correspond to the basic characteristics of the shop freight flow: the freight that is carried, the weight of each piece, the size, and the physical properties.

The second requirement is that of achieving the maximum possible labor productivity in transporting the freight.

The third requirement is that of carrying out transport operations with minimal capital and operational outlays.

For example, with respect to the conditions of the hull shop the means of transport must consist of railroad platforms, bridge carrains, trucks, and electric cars.

In ship building plants, freight is generally transported in accordance with what is known as unilateral pendulum diagram, in which the freight moves only in one direction (there are also bilateral and ring pendulum transport diagrams). In this diagram, calculation of the required amount of transport facilities K_t can be made as a first approximation in accordance with the following formula:

$$K_t = \frac{G}{GT_t} \frac{T_c K_v}{K_g} \text{ pieces,} \quad (41)$$

where T_c is the length of one transport cycle, equal to the time of the run, loading, and unloading, minutes;

K_v is the use coefficient of the means of transport in time, taking account of delays and idleness ($K_v = 1.1 + 1.2$);

G is the carrying capacity of the means of transport, tons;

T_t is the planned available work time of the means of transport in the course of a day, minutes;

K_g is the use coefficient of carrying capacity, including possible underloading ($K_g = 0.6 + 0.8$).

Ways to reduce outlays in transportation operations. Transport operations and loading-unloading operations directly associated with them are very labor-intensive and heavy. Overall outlays for such operations take up a considerable share of the product prime cost. Reducing outlays on transport and loading-unloading operations can be achieved in the following main ways:

mechanization of loading-unloading and some of the transport operations still done manually;

better utilization of transport facilities in time by adopting the ring and two-way pendulum systems of shipments on a predetermined route and schedule;

adoption of container shipping; and so on.

Planning and dispatcherization in transport operations. The plant's transport shop has a technical-economic plan of its work for the year and for each quarter, and operational plans for the month, day, and shift.

The technical-economic plan specifies the freight turnover, the volume of loading-unloading, the wage fund, the estimate of outlays, and the prime cost per unit of work: ton-kilometer, unit-hour, and so on.

The operational plan for the month pinpoints the volumes of shipments--especially the volume of loading-unloading work involved with the arrival of loaded and empty rail cars at the plant from the Ministry of Railways. In the operational plans for days and shifts the volume of work is pinpointed on the scale of individual shops and routes, indicating the type of freight being carried and the specific transport facilities allocated for such operations.

The shift-daily planning of transport operations in ship-building is based on shop orders submitted to the transport shop before noon of the preceding day. If on some very busy days the transport shop cannot fill all shop orders for the availability of transport facilities, then distribution of them with respect to the shops and the types of operations is made with the participation of the plant's chief dispatcher.

PART FOUR. PLANNING AND ACCOUNTING OF THE PRODUCTION-ECONOMIC ACTIVITY OF
A SHIP-BUILDING PLANT AND ITS SUBDIVISIONS

CHAPTER IV. TECHNICAL-ECONOMIC PLANNING

Section 64. Technical, Industrial, and Financial Plan of a Ship-Building
Plant

The technical, industrial, and financial plan and its connection with in-plant planning. The main administration of the Ministry, which governs the activity of the group of specialized enterprises, sets the enterprise's annual and quarterly plans only with respect to the basic (directive) indicators of its production-economic activity. For a ship-building plant, the directive indicators are the following:

for production--the product sales volume, the commercial output, and the production of the most important kinds of goods in physical terms (for example, the number of ships under construction and to be delivered). Of the overall product sales volume, new goods which match the best foreign and Soviet models in terms of characteristics are especially singled out. The new goods are included in the makeup of the most important types of goods;

for labor--the total wage fund;

for finances--the total profit, profitability (in percentage of the total fixed productive capital and normed circulating assets) and payments into the budget, including payment for capital and appropriations from the budget;

for capital construction--the total volume of centralized capital investments, including the volume of construction-installation work, and the introduction of fixed capital and production facilities due to centralized capital investments;

for the adoption of new equipment--the target with respect to the assimilation of new kinds of goods in production and the adoption of new technological processes having special importance for the development of the ship building industry;

Section 69. Labor and Wages Plan

The content of the plan. The labor and wages plan contains three subsections:

- 1) the plan for boosting labor productivity;
- 2) the plan setting the number of enterprise workers;
- 3) the wage fund plan.

The labor and wage plan derives from the preceding sections of the technical, industrial, and financial plan. Individual subsections of this plan are closely linked to each other, and calculations on them are made in a definite sequence.

The first to be determined is the planned level of labor productivity, because this determines the number of workers necessary to implement a given production program: the higher the level of labor productivity that can be achieved on the basis of adopting measures of the plan for increasing production effectiveness the smaller the number of workers that will be required to implement the production plan, and vice versa.

In the process of calculating labor productivity, determination is also made of the total number of industrial-production personnel. Through calculation the total number of personnel is allocated by categories (workers, engineering-technical personnel, employees, and so on).

Knowing the number of workers and their distribution by categories, subsequent calculations serves to determine the necessary size of the wage fund.

Let us examine in somewhat more detail the procedure of planning each subsection of the labor and wage plan.

The plan for increasing labor productivity. In Section 23 we have already presented a general concept concerning labor productivity. This indicator reflects the amount of goods turned out per unit of time by one worker or worker collective (crew, section, shop, enterprise, and so on). Consequently, in order to determine labor productivity in an enterprise, shop, or section it is essential to know the product volume produced per unit of time and to divide it by the number of workers.

In order to determine labor productivity, use is made of gross product volume; the unit of time used is the year, quarter, and month. Thus, the general formula for calculating labor productivity P_{la} for any subdivision takes the following form:

$$P_{la} = \frac{P_v}{C} \text{ rubles per worker,} \quad (42)$$

where P_v is the gross product volume for the planning period, rubles;

C is the average on establishment number of industrial-production personnel (PPP).

For example, if the annual plan of the enterprise with respect to gross product is 48 million rubles and according to the plan an average of 7,400 workers, engineering technical personnel, employees, and so on, are to work during the course of a year then the planned labor productivity for the year will be:

$$P_{la} = \frac{48,000,000}{7,400} = 6,486 \text{ rubles per worker.}$$

As has already been mentioned, the official planning and accounting of labor productivity is accomplished on the basis of gross output. However, when the product list of goods is changed labor productivity is also figured on the basis of the labor intensiveness of the production program or the production volume, measured in the normative cost of processing (NSO). In this case, in the numerator of the formula the gross product is replaced by the labor intensiveness of the program or the volume of NSO.

Labor productivity is planned with account taken of the effectiveness of measures of the technical progress plan as well as a number of factors relating to the enterprise's production program. In consolidated form all factors affecting labor productivity can be combined into several groups:

- raising the technical level of production;
- improving the organization of production and labor;
- improving the quality of the goods;
- increasing production volume;
- changes in the structure of the goods being produced.

The first three groups of factors (technical-economic) are a component part of the plan for improving production effectiveness; the latter two form part of the production program.

A major role in boosting labor productivity is played by technical-economic factors deriving from technical progress. These factors account for about 60 percent of the entire increase in labor productivity.

Calculation of the planned level of labor productivity is accomplished as follows.

First of all, determination is made of the initial number of industrial-production personnel for the planning year on condition that labor productivity compared with the current (base) year remains unchanged.

For example, labor productivity during the base year is 6,486 rubles per worker and the gross product volume for the planning year have been set at 53 million rubles. In that case, retaining the labor productivity, the following will be required during the planning year to fulfill the plan:

$$\frac{53,000,000}{6,486} = 8,170 \text{ workers.}$$

After that, for each group of factors affecting labor productivity, determination is made of the possible increase or decrease in the number of personnel and the overall result of the effect of all factors is computed. Let us assume that as a result of all calculations the possibility has been determined of decreasing the required number of personnel by 620 workers. Then the total number of industrial-production personnel necessary to fulfill the plan with respect to gross output set at 53 million rubles will be:

$$8,170 - 620 = 7,550 \text{ workers.}$$

From this, labor productivity during the planning will equal

$$\frac{53,000,000}{7,550} = 7,019 \text{ rubles per worker,}$$

and the increase in labor productivity will be:

$$\frac{7,019 - 6,486}{6,486} \cdot 100 = 8.2 \text{ percent.}$$

If the level of increased labor productivity obtained (8.2 percent) is inadequate to fulfill the tasks facing the plant collective during the planning year, then the technological service of the enterprise will get an assignment to work out additional organizational-technical measures aimed at improving production effectiveness.

The possible decrease in the number of personnel, deriving from the plan for improving production effectiveness, is determined by detailed calculations on each measure included in this plan. These calculations are made by the enterprise's technological service personnel in the process of drawing up the plan of improved production effectiveness, and all the planning service personnel have to do is utilize the results of these calculations in drawing the labor and wage plan.

Possible changes in the number of personnel depending on production factors are determined by the planning service. As has already been pointed out, the production factors affecting labor productivity are increased production volume and changes in the structure of the goods produced.

Increasing production volume inevitably leads to increased labor productivity, since it is chiefly the number of production workers that rises proportionally to the rise in production and the number of auxiliary workers, engineering-technical personnel, employees, and other personnel increases only slightly. As a result, the rise in the total number of industrial-production personnel lags considerably behind the rise in production volume; this leads to increased labor productivity on the part of the whole collective.

The possible provisional decrease in the number of industrial-production personnel E_c in connection with increased production volume is determined by the following formula:

$$E_c = \frac{C_{sp} (K_p - K_{is})}{100} \quad \text{workers,} \quad (43)$$

where C_{sp} is the number of service personnel (industrial-production personnel minus production workers) during the base period, workers;

K_p is the increase in gross output, percent;

K_{is} is the increase in the number of service personnel in connection with the increase in production volume, percent.

For example, if the increase in gross output is 10 percent and the number of service personnel, amounting to 4,200 workers during the base period, should increase by two percent, then the possible decrease in the number of personnel in connection with the rise in gross output will be:

$$E_c = \frac{4,200 (10-2)}{100} = 336 \text{ workers.}$$

If increasing production volume (the first production factor) inevitably leads to a rise in this indicator, the second production factor--changes in the structure of the good being produced--can lead both to an increase and to a decrease in labor productivity. Quantitative calculation of the effect of changes in the structure of the goods being produced on the number of personnel and labor productivity is accomplished by means of a rather complex procedure.

First to be determined is the labor intensiveness of the production program of the base year and the planning year. Knowing the labor intensiveness of the production program and the gross output volume for two adjacent years it is possible to determine what is known as the specific labor intensiveness of gross output--that is, the amount of labor and norm-hours per selected unit of gross output, for example, 100 rubles.

If the labor intensiveness of the production program during the base year and the planning year is respectively 4.35 and 5.05 million norm-hours and the gross output is 48 and 53 million rubles, then the labor intensiveness per 100 rubles of gross output will equal:

during the base year

$$T_s^b = \frac{4,350,000}{48,000,000} \cdot 100 = 9.1 \text{ norm-hours};$$

during the planning year

$$T_s^p = \frac{5,050,000}{53,000,000} \cdot 100 = 9.5 \text{ norm-hours}.$$

The increase in the specific labor intensiveness during the planning year indicates that within the structure of the plant's output there has been a shift toward labor-intensive goods--that is, the specific value (share) of labor-intensive output in the plant's program has increased.

A change in the structure of the goods being produced affects only the number of production workers. Calculation of the change in the number of this category of workers E_r depending on the structure of the goods being produced is accomplished by the following formula:

$$E_r = \frac{T_s^p - T_s^b}{T_s^b} C_{pw} \text{ workers,} \quad (44)$$

where T_s^p and T_s^b are the specific labor intensiveness of gross output during the plan year and the base year, norm-hours per ruble;

C_{pw} is the number of production workers during the planning year provided that the labor productivity of the base year is retained, workers.

For example, if C_{pw} is 2,819 workers, $T_s^p = 9.5$ norm-hours per ruble, and $T_s^b = 9.1$ norm-hours per 100 rubles, then

$$E_r = \frac{9.5 - 9.1}{9.1} \cdot 2819 = 124 \text{ workers}.$$

All else being equal, a change in the structure of the goods being produced requires an increase in the number of production workers--by 124 workers--and leads to a reduction in labor productivity in terms of its value measurement.

Calculation of the required number of workers by categories. As has already been mentioned, during the process of calculating labor productivity a determination is made of the total number of industrial-production personnel. The planning task further consists of setting in detail the makeup of the personnel by individual categories. Especially important is the planning of the worker cadre requirements, because this is the most numerous category of plant personnel (about 75 percent of all personnel); it includes workers of a great variety of trades and specialties. The planning task does not consist merely in determining the required number of workers but also in pinpointing their professional makeup.

The required number of production workers C_{pw} is determined on the basis of the labor intensiveness of the production program, the useful available work time per worker, and the percentage of norm fulfillment in accordance with the following formula:

$$C_{pw} = \frac{T_p}{T_r K_n} \cdot 100 \text{ workers,} \quad (45)$$

where T_p is the labor intensiveness of the production program, norm hours;

T_r is the useful annual available work time per worker, hours;

K_n is the norm fulfillment, percent.

For example, if $T_p = 5.05$ million norm hours, $T_r = 1,862$ hours, and $K_n = 120$ percent, then

$$C_{pw} = \frac{5,050,000}{1,862 \cdot 120} \cdot 100 = 2.265 \text{ workers.}$$

The same formula is used to determine the required number of workers in each trade, with the difference that instead of the labor intensiveness of the production program we take the labor intensiveness of the work of a given trade, and the percentage of norm fulfillment appropriate to the given trade.

The required number of auxiliary workers is determined by the labor intensiveness of the work, by service norms, and by work places.

Calculation by labor intensiveness of the work is used to find the number of auxiliary workers engaged in normed operations. This calculation is similar to the calculation of the number of production workers.

Calculations by service norms and work places are used to establish the number of auxiliary workers engaged in non normed work. Examples of such calculations are given in Table 12 and Table 13.

Table 12. Calculation of Number of Auxiliary Workers by Service Norms

(1) Профессия	(2) Разряд	(3) Обслуживаемые агрегаты	(4) Количество агрегатов шт.	(5) Норма обслуживания шт.	(6) Количество смен	(7) Явочное количество рабочих, чел. $\frac{(4) \cdot (5)}{(6)}$	(8) Невыход на работу, %	(9) Списочное количество рабочих по плану $\frac{(7) \cdot (8)}{(7) + 100}$
1	2	3	4	5	6	7	8	9
(10) Дежурный слесарь	4	(11) Станки	1250	50	2	50	10	55

Key:

1. Trade
2. Grade
3. Units being serviced
4. Number of units, pieces
5. Service norm, pieces
6. Number of shifts
7. Number of workers reporting for duty $\frac{(4)}{(5)} \cdot (6)$
8. Absenteeism, percent
9. Number of workers on establishment according to plan $\frac{(7)}{(7) + 100} \cdot (8)$
10. Fitter on duty
11. Machines

Table 13. Calculation of Number of Auxiliary Workers by Work Places

(1) Профессия	(2) Разряд	(3) Количество обслуживаемых агрегатов, шт.	(4) Количество рабочих на один агрегат, чел.	(5) Потребное количество рабочих в одну смену, чел. (3) · (4)	(6) Количество смен	(7) Явочное количество рабочих, чел. (5) · (6)	(8) Невыход на работу, %	(9) Списочное количество рабочих по плану, чел. $(7) + \frac{(7) \cdot (8)}{100}$
1	2	3	4	5	6	7	8	9
(10) Крановщик	4	40	1	40	2	80	10	88
...

Key:

1. Trade
2. Grade
3. Number of units to be serviced, pieces
4. Number of workers per unit
5. Required number of workers per shift, workers $(3) \cdot (4)$
6. Number of shifts
7. Number of workers reporting for duty $(5) \cdot (6)$
8. Absenteeism, percent
9. Number of workers on establishment according to plan $(7) + \frac{(7) \cdot (8)}{100}$
10. Crane operator

The number of engineering-technical personnel and employees is determined by staff rosters which for the plant administration and each shop are confirmed by the enterprise director on the basis of standard administration structures and consolidated personnel number normatives.

The number of junior service personnel is established by service norms and work places, while the number of security personnel is determined by the number of posts and the work conditions.

The number of non industrial personnel is determined by staff rosters, service norms, and, in individual cases, by the labor intensiveness of the work.

Planning of the number of workers is completed by drawing up the available manpower balance. In this balance, the planned requirements for workers of various trades are matched against the ones actually present. The results of the balance can reveal additional cadre requirements. The cadre hiring

and training plan with respect to the most important trades indicates the sources of meeting the cadre requirements (production-technical schools, institutes, tekhnikums, organized recruiting, and so on).

Calculation of the wage fund and average wages. The wage fund is planned in accordance with its structure, given in Figure 30.

Figure 30. Structure of the Wage Fund

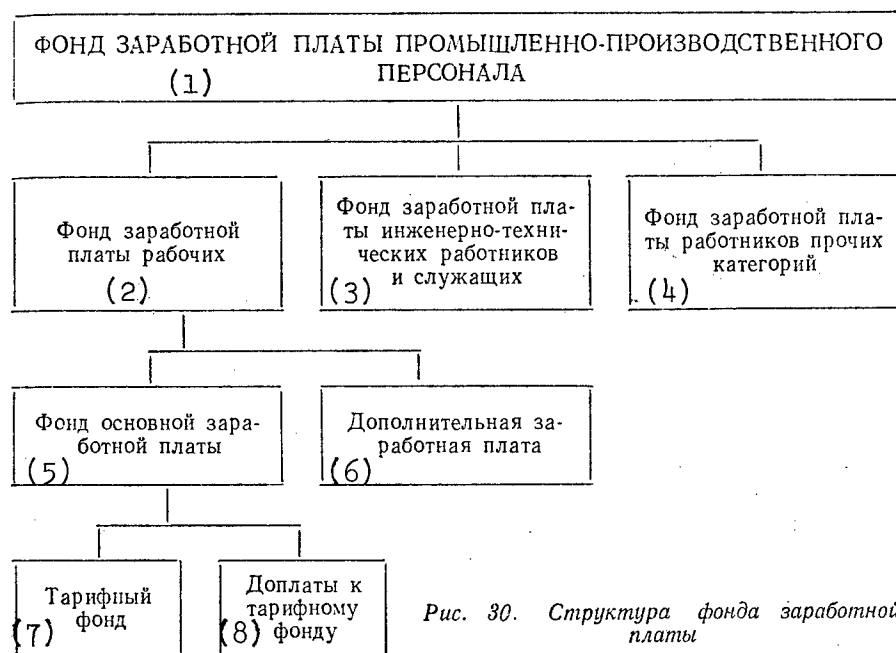


Рис. 30. Структура фонда заработной платы

Key:

1. Wage fund for industrial-production personnel
2. Wage fund for workers
3. Wage fund for engineering-technical personnel and employees
4. Wage fund for workers of other categories
5. Basic wage fund
6. Supplementary wages
7. Wage rate fund
8. Additional payments to wage rate fund

Most complicated is the calculation of the wage fund for workers. This calculation begins with establishment of the rated wage fund.

The rated wage fund represents the total monetary funds paid out to workers in terms of piece work or time rates based on norm-hours completed (for

piece workers) or calendar hours worked (for time workers). The amount of this fund F_t^S for the planning period (year, quarter, and so on) for workers on piece work rates is determined by the following formula:

$$F_t^S = T_p R_{pr} \text{ rubles,} \quad (46)$$

where T_p is the labor intensiveness of the production program for the planning period, norm hours;

R_{pr} is the hourly wage rate for the medium grade, rubles per norm-hours (average piece work rate).

For example, if the labor intensiveness of the annual program is five million norm hours and the medium wage rate is 0.47 rubles per norm hour, then

$$F_t^S = 5,000,000 \cdot 0.47 = 2.35 \text{ million rubles.}$$

The rated wage fund for time workers F_t^D for the planning period is determined by the following formula:

$$F_t^D = T_v S_c^D C_{pv} \text{ rubles,} \quad (47)$$

where T_v is the calculated annual available work time per worker, hours. It equals about 1,862 hours (nominal available work time of 2,069 hours minus plan-accounted absences of 10 percent of the nominal time);

S_c^D is the average hourly wage rate for work paid by time, rubles per hour;

C_{pv} is the average annual number of time-paid workers.

To the rated wage fund are added planned additional payments: for tru leaders, bonuses for over fulfillment of technically substantiated norms, for fulfillment of the plan and high quality output. For piece work personnel, additional payments amount to about five percent, and for time-paid workers about 20 percent of the rated wage fund.

The total rated wage fund and planned additional payments constitute the basic wage fund F_0 . With account taken of the above indicated amount of additional payments, the basic wage fund will be:

for piece work personnel

$$F_{bw}^S = F_t^S + 0.05 F_t^S = 1.05 F_t^S. \quad (48)$$

If $F_t = 2.35$ million rubles, then F_{bw}^S equals $1.05 \cdot 2.35 = 2.467$ million rubles;

For time-paid workers

$$F_{bw}^D = F_t^D + 0.2 F_t^D = 1.2 F_t^D. \quad (49)$$

If we now add to the basic wage fund for workers the planned amount of additional wages, then the total amount of these funds will constitute the full wage fund for workers F_p . The amount of additional wages (vacation pay, pay for time spent in fulfilling state and social obligations, and so on) is planned to approximate six percent of the basic wage fund, that is:

$$F_p = F_{bw} + 0.06 F_{bw} = 1.06 F_{bw}. \quad (50)$$

If $F_{bw}^S = 2.467$ million rubles, then $F_p = 1.06 \cdot 2.467 = 2.615$ million rubles.

The wage fund for engineering-technical personnel and employees is determined by the staff roster. The same method is used to determine the wage fund for workers of other categories.

The total amount of wage funds for workers of all categories, including the wages paid to the non industrial group, should not exceed the amount established by directive.

Calculation of the wage fund concludes with determination of the average wage Z_{av} paid per industrial-production worker, with account taken of payments from the material incentive fund. This amount is established by the following formula:

$$Z_{av} = \frac{F_p + F_{mi}}{C_p} \text{ rubles per worker,} \quad (51)$$

where Z_{av} is the average wage paid per worker, rubles per worker;

F_p is the wages paid to industrial-production personnel, rubles;

F_{mi} is the bonuses paid from the material incentive fund, rubles;

C_p is the average annual number of industrial-production personnel.

For example, if F_p is 11.778 million rubles, $F_{mi} = 1.32$ million rubles,

and $C_p = 7,550$ workers, then

$$Z_{av} = \frac{11,778,000 + 1,320,000}{7,550} = 1,734 \text{ rubles per worker per year.}$$

or 144 rubles per month.

After determining the absolute amount of the average wages paid per worker, we determine the rate of its increase compared to the preceding year, and that amount is compared with the rate of increase in labor productivity. The ratio between the growth rates of these indicators is considered satisfactory only if the rate of increase in labor productivity surpasses the rate of increase in average wages. If, however, the average wages are rising faster than the increase in labor productivity, the enterprise is obliged to take steps either to boost labor productivity or to reduce the wage fund.

For example, if the average wage paid per worker was 1,651 rubles during the preceding year and 1,734 rubles during the planning year, then its growth rate will be

$$\frac{1,734 - 1,651}{1,651} \cdot 100 = 5 \text{ percent.}$$

In the above example with respect to calculation of labor productivity (see page 239), its increase amounted to 8.2 percent; this is satisfactory in comparison with the five percent increase in average wages.

Rising labor productivity that surpasses the rise in average wages is an objective necessity, because only under such conditions is it possible not only to maintain but also to raise the specific value (share) of surplus product in the country's national income (see Figure 16). This in turn creates the necessary conditions for further expanding production, increasing social consumption funds (funds allocated for health care, education, social security, and so on), and in the long run makes it possible to meet the ever-rising requirements of the workers to a greater extent.

In the national economy plan for 1971 through 1975 it states that the average wages in the five-year period should rise by 20 to 22 percent, and labor productivity should rise by 36 to 40 percent.

Labor and wage plan for shops and sections. Shop operation indicators with respect to labor and wages, similarly to enterprise indicators, are divided into directive (confirmed by the director) and calculated (confirmed by the shop chief).

In the shop labor and wage plan the following are established by directive: labor productivity, total number of workers, and wage fund. In addition, the shop also has confirmed for it the amount of funds allocated from the material incentive fund of the enterprise (the shop's material incentive fund) for paying bonuses to shop workers.

The following shop operation labor indicators are determined by calculation: the number of workers, the wage fund, and average wages by categories of workers.

The section labor and wage plan includes the following: labor productivity, the number of workers, and the wage fund. In addition, the section is allocated a foreman's fund in the amount of up to three percent of the section's wage fund.

Wage funds and the number of personnel by shop sections, added to the wage fund and the strength of the administrative apparatus and the shop service personnel, must not total up to more than the corresponding indicators approved for the shop and indicated in its plan.

The method of calculating indicators of the shop and section plan with respect to labor and wages differs practically not at all from the above-outlined method of calculating the corresponding enterprise indicators--that is, the labor productivity of shop personnel (section personnel) is determined by dividing the shop's (section's) gross output by the number of workers on establishment; the necessary number of piece work personnel is determined by the labor intensiveness of the production program, and so on.

Section 70. Product Prime Cost and Profit Plan

The content and procedure of formulating the product prime cost plan. The basic indicators of the product prime cost plan are the overall outlays on production, the prime cost per unit of output, and the prime cost of the commercial product. In order to determine the prime cost per unit of output and the total commercial product it is essential to determine the amount of shop and all-plant expenditures.

The product prime cost plan is formulated in the following way. First of all, estimates are drawn up of shop and all-plant expenditures, which include indirect outlays for the production of goods--that is, outlays of a general nature which cannot be directly assigned to the prime cost of specific items (see Section 29). Then on the basis of approved norms for direct outlays (outlays for material, sets of items, and basic wages paid to production workers) and data obtained on indirect outlays, calculations are drawn up (prime cost calculations) per unit of each type of product. Knowing the prime cost per unit of output it is possible to determine the prime cost of all the commercial product. And in concluding the calculation of the product prime cost plan we determine the total amount of enterprise outlays during the course of the planning period, with account taken of work in progress and non industrial operations, by drawing up estimates of outlays on production.

The estimation of shop expenditures. It was mentioned briefly in Section 29 that shop expenditures include two groups of outlays: group A and group B. Expenditures of group A include outlays on overall shop maintenance and administration (general shop expenditures), while group B includes outlays on the maintenance and operation of the equipment.

A technically substantiated calculation of the estimate of shop expenditures assumes a detailed calculation of necessary outlays for each item in particular.

Most of the items in shop expenditures contain a complex of various outlays made with respect to the given direction of activity of the shop.

An annual estimate of shop expenditures to reveal each item of expenditure by outlay components is given in Table 14. From this table we can see that the shop expenditures include outlays on the following components:

- auxiliary materials;
- fuel;
- power;
- wages;
- deductions for social security;
- amortization;
- auxiliary shop services;
- other outlays.

For this reason, planning of the amount of shop expenditures entails determining the amount of outlays for each component, to be totaled subsequently, for each direction of these expenditures (for each item).

For example, the item "Equipment Operation" includes outlays for the following components: the cost of auxiliary materials necessary to maintain the equipment and keep it in working order (lubricating and cleaning materials, cooling emulsions, and so on); the cost of fuel, electricity, and other types of power utilized to drive the equipment; basic and supplementary wages paid to auxiliary workers engaged in servicing the equipment (adjusters, mechanics, and so on); deductions for social security proportional to the basic wages paid to this category of workers; the cost of services of the auxiliary shops for the maintenance and operation of the equipment.

Expenditures on auxiliary materials (lubricating and cleaning materials, small spare parts, and so on) are determined in accordance with approved norms of consumption. For example, the consumption norm of cleaning materials of 40 kilograms per machine per year is multiplied by the number of machines in the shop and by the price per kilogram of these materials.

In practice, when calculating outlays on auxiliary materials widespread use is made of consolidated normatives based on an analysis of actual outlays during previous years. This normative in individual shops may be, for example, 35 to 40 per unit of equipment per year.

Expenditures on fuel for technological purposes are established in accordance with the specifications on machines using gas, fuel oil, and other types of fuel, in accordance with the volume of annual operation and prices on fuel.

The cost of drive and technological electricity Z_e can be determined by the following formula:

$$Z_e = \frac{M_{av} K_o T_p^o K_z K_m}{K_{lc} K_d} P, \quad (52)$$

where M_{av} is the average installed capacity per unit of equipment, kilowatts per piece;

K_o is the quantity of equipment, pieces;

T_p^o is the planned available operating time of the equipment per year working in two shifts, subtracting from this the amount of time spent in planned repairs, hours;

K_z is the average work load coefficient of the installed capacity;

K_m is the capacity utilization coefficient in time;

K_{lc} is the coefficient which takes account of losses of current in the power network;

K_d is the efficiency coefficient of the electric motors;

P is the price of one kilowatt hour of electricity, rubles per kilowatt hour.

If, for example, the average installed capacity per unit of equipment $M_{av}=10$ kilowatts per piece, the quantity of equipment $K_o=58$ pieces, the planned available equipment work time $T_p=3,740$ hours per year, the coefficient $K_z=0.7$, $K_m=0.7$, $K_{lc}=0.95$, $K_d=0.87$, and the price of a kilowatt hour of electricity $P=0.012$ rubles, then

$$Z_e = \frac{10 \cdot 58 \cdot 3,740 \cdot 0.7 \cdot 0.7}{0.95 \cdot 0.87} \cdot 0.012 = 10,587 \text{ rubles per year.}$$

From the calculation of the annual wage fund paid to all auxiliary workers we determine the wages paid to workers engaged in servicing the equipment (repair mechanics, electricians, shop transport drivers, crane operators, and so on). In rough calculation we may assume that wages for this category of workers constitute about 60 to 70 percent of the wages paid to all auxiliary workers.

The amount of deductions for social security is determined according to the established normative (7.7 percent of the wage fund of this category of shop workers).

The same method--based on normatives, estimates, and other planning-accounting data--is used to determine the amount of outlays for all other kinds of shop expenditures.

Drawing up of the estimate of shop expenditures concludes with a determination of their level (percentage) with respect to the basic wages paid to production workers. If, for example, the basic wages paid to production workers amount to 360,000 rubles, then the level (percentage) of shop expenditures in accordance with data in Table 14 will be the following:

$$\frac{838}{360} \cdot 100 = 232 \text{ percent.}$$

Table 14. Annual Estimate of Shop Overheads

(1) № п.п.	(2) Статья расхода	(3) Величина затрат, руб.								
		(5) В том числе по элементам								(13)
		(4) Всего	(6) Вспомогательные материалы	(7) Топливо	(8) Энергия	(9) Зарплата основная и дополнительная	(10) Отчисления на соцстрах	(11) Амортизационные отчисления	(12) Услуги вспомогательных цехов	
1	2	3	4	5	6	7	8	9	10	11
(14) 4 Группа А. Затраты по общему обслуживанию цеха и управлению (общецеховые расходы)										
(15)	Содержание аппарата управления цеха	130	—	—	—	121	9	—	—	—
(16)	Содержание прочего цехового персонала	19	—	—	—	18	1	—	—	—
(17)	Амортизация зданий, сооружений и инвентаря	45	—	—	—	—	—	45	—	—
(18)	Содержание зданий, сооружений и инвентаря	59,8	15	—	5	35	2,8	—	2	—
(19)	Текущий ремонт зданий, сооружений и инвентаря	21,4	12	—	—	5	0,4	—	4	—
(20)	Испытания, опыты и исследования, рационализация и изобретательство	7,3	1	—	—	4	0,3	—	1	1
(21)	Охрана труда	50,0	7	—	—	6	0,5	—	30	7
(22)	Износ малоценного и быстроизнашивающегося инвентаря	28	28	—	—	—	—	—	—	—
(23)	Дополнительная заработная плата производственных рабочих и отчисления на социальное страхование по ней	49	—	—	—	22	27	—	—	—
(24)	Прочие расходы	5	—	—	—	—	—	—	—	5
	(25) Итого расходы по группе А	414	63	—	5	211	41	45	36	13
(26) Группа Б. Расходы на содержание и эксплуатацию оборудования										
11(27)	Амортизация оборудования и транспортных средств	114	—	—	—	—	—	114	—	—
12(28)	Эксплуатация оборудования (кроме расходов на текущий ремонт)	155	29	12	60	40	3	—	11	—
13(29)	Текущий ремонт оборудования и транспортных средств	52	18	—	—	25	2	—	7	—

[Table 14 continued on following page]

(1) № п. п.	(2) Статья расхода	(3)	Величина затрат, руб.								
		(4) Всего	(5) В том числе по элементам								
			Вспомогатель- ные материалы	Топливо	Энергия	Зарплата основ- ная и дополни- тельная	Отчисления на соцстрах	Амортизацион- ные отчисления	Услуги вспомо- гательных цехов	Прочие расходы	
1	2	3	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
14(30)	Внутризаводское пере- мещение грузов	64	2	—	—	40	3	—	19	—	
15(31)	Износ малоценных и быстроизнашивающихся инструментов и приспо- соблений	36	36	—	—	—	—	—	—	—	
16(32)	Прочие расходы	2	—	—	—	—	—	—	—	2	
(33)	Итого расходы по группе Б	423	85	12	60	105	8	114	37	2	
(34)	Всего цеховых на- кладных расходов	838	148	12	65	316	49	159	74	15	

Key:

1. Number in sequence
2. Expenditure item
3. Amount of outlays, rubles
4. Total
5. Including by components
6. Auxiliary materials
7. Fuel
8. Power
9. Basic and supplementary wages
10. Deductions for social security
11. Amortization deductions
12. Services of auxiliary shops
13. Other expenditures
14. Group A. outlays for general shop maintenance and administration (all-shop expenditures)
15. Maintenance of shop administrative apparatus
16. Maintenance of other shop personnel
17. Amortization of buildings, structures, and furnishings
18. Maintenance of buildings, structures, and furnishings
19. Current repairs to buildings, structures, and furnishings

[Key continued on following page]

20. Tests, experiments and research, rationalization, and invention
21. Labor protection
22. Wear of low-cost and fast-wearing inventory
23. Supplementary wages paid to production workers and deductions for social security for them
24. Other expenditures
25. Total expenditures in group A
26. Group B. Expenditures on maintenance and operation of equipment
27. Amortization of equipment and transport facilities
28. Operation of equipment (exclusive of expenditures on current repairs)
29. Current repairs on equipment and transport facilities
30. In-plant freight movement
31. Wear of low-cost and fast-wearing tools and accessories
32. Other expenditures
33. Total expenditures in group B
34. Total shop overheads

Estimates of shop expenditures are drawn up for all production shops, after which these outlays are consolidated into a single general estimate of shop expenditures of the enterprise.

Estimates of shop expenditures are also drawn up in the auxiliary shops. These expenditures are in the established procedure incorporated in the product prime cost of the auxiliary shops (steam, air, water, transport, repairs, and so on) and through it transferred to the shop expenditures of the production shops. In this way, the expenditures of the production shops also include the overhead expenditures of the auxiliary shops in complex form.

Estimate of all-plant expenditures. Planning of the amount of all-plant expenditures is accomplished on the same principle as the planning of shop expenditures--that is, it is based on: norms of fuel and power consumption for heating and lighting of general plant buildings; the wage fund for workers of the plant administration; norms of amortization deductions; estimates of expenditures for business travel, cadre training, postal and telegraph services, labor protection, invention and rationalization, and so on.

The planned calculation per unit of output. In Section 30 we examined the basic principles of calculating unit of output in order to establish the wholesale price of it. Calculation of the product in order to establish the price is known as the estimated calculation. However, planned outlays on the manufacture of a unit of output, as a rule, do not coincide with the estimated calculation. The level of planned outlays per unit of product is established by drawing up planned calculations which take account of the specific conditions of the product's manufacture during the planning year, also directive objectives with respect to labor productivity and profit. Planned calculations call for a systematic reduction of outlays on the manufacture of a unit of product, which can result from increased labor productivity, reduced material outlays, and production volume growth.

Planned calculations are drawn up for all types of goods to be produced during the planning year. In ship-building production these calculations are established for each ship in particular or for a group of small ships. For the remaining goods produced by ship building plants, planned calculations are drawn up for the year, broken down by quarters. For example, the average planned prime cost of one capstan delivered in accordance with the MZK plan is 3,210 rubles, including 3,250 rubles for capstans to be delivered during the first quarter, 3,225 rubles for those to be delivered during the second quarter, 3,200 rubles for those to be delivered during the third quarter, and 3,175 rubles for those to be delivered during the fourth quarter.

The planned calculations present the level of planned outlays and the wholesale price per unit of product. The difference between the wholesale price and the outlays shows the level of planned profit with respect to that type of product.

In ship-building, with its lengthy production cycle, it is necessary to draw up several planned calculations for a vessel: a preliminary planned calculation is drawn up during the year construction begins, while during the year that it is delivered a revised calculation is drawn up which reflects factors and circumstances not taken account of earlier. In practice, the revised planned calculation of a large ship under construction for several years represents the total of verified actual outlays for the preceeding periods of construction and planned outlays for the remainder of the volume of work during the year the ship is delivered.

The prime cost of commercial goods represents the total outlays for an enterprise's finished (commercial) goods turned out during the planning period. It is established on the basis of planned calculations per unit of product turned out. An example of the calculation of the plan with respect to the prime cost of the commercial product is given in Table 15.

Table 15. Annual Plant Plan with Respect to Prime Cost of Commercial Goods

№ п. п.	Наименование продукции	Количе- ство	Действую- щая оптовая цена единицы товарной продукции, тыс. руб.	Плановая себестоимость единицы товарной продукции, тыс. руб.	Стоимость товарной продукции, тыс. руб. (3)·(4)	Плановая себестоим- ость товар- ной про- дукции, тыс. руб. (3)·(5)	Затраты на 1 руб. стоимости товарной продук- ции, коп. (7):(6)·100
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	2	3	4	5	6	7	8
1	(9) Траулеры проекта А:						
(10)	заводские № 105—109	5	1600	1360	8 000	6 800	—
(11)	заводские № 110—113	4	1500	1280	6 000	5 120	—
(12)	Итого по проекту А	—	—	—	14 000	11 920	85
2	(13) Изделия, поставляемые по межзаводской кооперации:						
(14)	шпили	200	4	3,2	800	640	—
(15)	рулевые машины	320	5	4,3	1600	1376	—
(16)	Итого по МЗК	—	—	—	2400	2016	84
3	(17) Изделия, поставляемые по межотраслевой кооперации:						
(18)	редукторы	500	1,5	1,3	750	650	—
(19)	арматура	3500	0,2	0,15	700	525	—
(20)	Итого по межотраслевой кооперации	—	—	—	1450	1175	81
4	(21) Изделия народного потребления:						
(22)	шкафы книжные	10 000	0,04	0,038	400	380	—
(23)	диван-кровати	5 000	0,09	0,087	450	435	—
(24)	Итого по изделиям народного потреб- ления	—	—	—	850	815	96
(25)	Всего по товарной продукции завода	—	—	—	18 700	15 926	85

[Key on following page]

Key:

1. Number in sequence
2. Name of product
3. Number
4. Effective wholesale price per unit of commercial product,
thousands of rubles
5. Planned prime cost per unit of commercial product,
thousands of rubles
6. Value of commercial product,
thousands of rubles
 $(3) \cdot (4)$
7. Planned prime cost of commercial product,
thousands of rubles
 $(3) \cdot (5)$
8. Outlays per ruble of value of commercial
products, kopeks
 $(7):(6) \cdot 100$
9. Trawlers of plan A:
10. Plant No 105-109
11. Plant No 110-113
12. Total for plan A
13. Items delivered in accordance with MZK:
14. Capstans
15. Control actuators
16. Total for MZK
17. Items delivered through inter-sector cooperation:
18. Reductors
19. Fittings
20. Total for inter-sector cooperation
21. Consumer goods:
22. Book cabinets
23. Bunk beds
24. Total for consumer items
25. Total for plant's commercial goods

In practical work, in evaluating the level of prime cost of the product widespread use is made of the indicator of outlays per ruble of value of the commercial product. In the example cited (see Table 15) these outlays amount to 85 kopeks on the average for all the commercial product of the plant. This means that on the average, for each ruble of product produced the plant spends 85 kopeks and, consequently earns 15 kopeks in profit.

Estimate of outlays for production. The drawing up of the plan with respect to the product's prime cost concludes with a determination of the estimate of outlays for production. This estimate includes the total of all outlays of the enterprise during the planning period and thereby reflects outlays not only on the basic production but also auxiliary production, and also outlays on work of an unindustrial nature performed by the enterprise (capital construction carried out by the plant's own resources; capital repairs to buildings; housing-utility operations; and so on)--that is, the economic results of all the preceding sections of the technical, industrial, and financial plan.

The estimate of outlays for production is drawn up for the year, broken down by quarters. An example of a yearly outlay estimate (not broken down by quarters) is given in Table 16.

Table 16. Estimate of Outlays on Production

№ п. п. (1)	Содержание затрат (2)	Схема расчета (3)	По плану на год, тыс. руб. (4)
1 (5)	Сырье и основные материалы	(28) Отдельный расчет по каждому элементу затрат	4 950
2 (6)	Вспомогательные материалы		490
3 (7)	Контрагентские поставки и работы		6 100
4 (8)	Топливо		335
5 (9)	Энергия		340
6 (10)	Заработная плата основная и дополнительная		4 905
7 (11)	Отчисления на социальное страхование		380
8 (12)	Амортизация основных фондов		1 520
9 (13)	Прочие расходы		680
10 (14)	Итого затрат на производство	(29) Сумма пп. от 1 до 9	19 700
11 (15)	Затраты на работы и услуги, не включаемые в валовую продукцию	(30) Отдельный расчет	1 132
12 (16)	Себестоимость валовой продукции	(31) п.10—п.11	18 568
13 (17)	Производственная себестоимость товарной продукции	Отдельный расчет	15 768
14 (18)	Изменение себестоимости остатков незавершенного производства	(32) п. 12—п.13	+2 800
15 (19)	Внепроизводственные расходы	Отдельный расчет	158
16 (20)	Полная себестоимость товарной продукции	(33) п.13 + п.15	15 926
17 (21)	Стоимость товарной продукции	Отдельный расчет	18 700
18 (22)	Прибыль от производства товарной продукции	(34) п.17—п.16	2 774
19 (23)	Затраты на 1 руб. стоимости товарной продукции, коп.	(35) п.16 : п.17	85
20 (24)	Изменение себестоимости остатков нерезализованной продукции (на складе и отгруженной)	Отдельный расчет	—130
21 (25)	Себестоимость реализуемой товарной продукции	(36) п.16—п.20	16 056
22 (26)	Стоимость объема реализуемой продукции	Отдельный расчет	18 850
23 (27)	Прибыль от реализации товарной продукции	(37) п.22—п.21	2 794

[Key on following page]

Key:

1. Number in sequence
2. Content of outlays
3. Pattern of calculation
4. By yearly plan, thousands of rubles
5. Raw materials and basic supplies
6. Auxiliary materials
7. Contract agent deliveries and work
8. Fuel
9. Power
10. Basic and supplementary wages
11. Deductions for social security
12. Amortization of fixed capital
13. Other expenditures
14. Total outlays on production
15. Outlays for work and services not included in the gross output
16. Prime cost of gross output
17. Production prime costs of commercial goods
18. Change in prime cost of remaining work in progress
19. Expenditures outside of production
20. Full prime cost of commercial product
21. Value of commercial product
22. Profit from the production of commercial product
23. Outlays per ruble of value of commercial product, kopeks
24. Change in prime cost of remaining unsold goods (in warehouse and shipped)
25. Prime cost of commercial products sold
26. Value of volume of goods sold
27. Profit from sale of commercial product
28. Individual calculation by each component of outlays
29. Total of items 1 through 9
30. Individual calculation
31. Item 10-Item 11
32. Item 12-Item 13
33. Item 13+Item 15
34. Item 17-Item 16
35. Item 16:Item 17
36. Item 16-Item 20
37. Item 22-Item 21

The estimate of outlays for production is drawn up in the planning-economic division of the enterprise, with the participation of almost all the other divisions and services. For example, in determining outlays for basic and auxiliary materials the planning-economic division is helped by the division of material-technical supplies, which provides a cost evaluation of the material-technical supply plan. Outlays for contract agent deliveries are determined on the basis of data from the external cooperation division, while those for contract agent work (assembly) are determined with the help of the ships' builders. In determining outlays for fuel and power use is made of

data from the main power engineer's division. Wages--basic and supplementary--are figured wholly in terms of data from the labor and wage plan, and deductions for social security are figured in the amount of 7.7 of the total wages. Amortization of fixed capital is determined in collaboration with the head accountant on the basis of the specific composition of the fixed capital and norms of amortization deductions, with account taken of the planned introduction of new capacities in accordance with data from the capital construction division, and of the planned removal of capacities in accordance with data from the chief mechanic's division and the chief power engineer's division. Other expenditures (on business travel, postal and telegraph services, payment of awards for rationalization proposals, and so on) are established on the basis of estimates of shop and all-plant expenditures.

The total of all the above indicated expenditures constitutes the enterprise's overall outlays on production, including outlays for work of an unindustrial nature. The estimate of outlays of an individual project delineate outlays on work and services that are not included in the gross output. The amount of these outlays is determined by the PEO [planning-economic division] together with the capital construction division, the chief mechanic's division, the housing-utility division, and so on. Subtracting from the total outlays on production the outlays on work which is not included in the gross output, the PEO determines the prime cost of the gross product (see item 12).

The prime cost of the commercial product is determined separately in accordance with the above-indicated scheme (see Table 15). Subtracting the prime cost of the commercial product from the prime cost of the gross output, the PEO of the ship building plant determines the change in the prime cost of the remaining work in progress (see Table 16, item 14). This is a cardinal factor in calculating the estimate of outlays in ship building, because in all other sectors the prime cost of the gross output is determined not directly, as indicated above, but by totaling the outlays for the commercial product together with the change in the prime cost of the remaining work in progress.

The estimate of outlays is used to determine the profit earned from the sale of the commercial product. The level of this profit, as well as the overall level of outlays on production, constitutes the initial data for drawing up the last section of the technical, industrial, and financial plan--the enterprise's financial plan.

The shop's product prime cost plan. An enterprise cannot be confident of fulfilling the plan with respect to product prime cost unless the objectives of this plan are brought down to the shop level, unless the shops make efforts and are responsible for this indicator, unless they are materially motivated to fulfill and overfulfill it. For this reason, the product prime cost plan is one of the most important indicators of a shop's operation, indicators approved for the shop by the enterprise director.

The shop's product prime cost plan includes two indicators:

- 1) the prime per unit of commercial product of the shop;
- 2) the estimate of shop expenditures.

The basic indicator of the two is the prime cost per unit of commercial product and the prime cost of all the shop's commercial output for the planning period. The shop's performance is judged to be positive and its collective is materially rewarded only if it fulfills and overfulfills the plan with respect to commercial product prime cost.

It has already been mentioned, in Section 65, that in ship-building the following are units of commercial output: volumes of work with respect to shop-stages for ships, and volumes of work with respect to sets of machinery for goods that are not products of ship building activity. Proceeding on this basis, the plant's PEO, determining the planned calculation per unit of commercial product (ship, capstan, control actuator, and so on), is obliged to delineate the prime cost of the work of each shop taking part in its manufacture. Moreover, the shop prime cost includes only those outlays which depend on the shop's work (the cost of materials, basic wages paid to production workers, and shop expenditures). In addition, the volume of the shop's work on a ship is necessarily distributed in accordance with the shop-stages constituting it. An example of the distribution of the planning prime cost of a ship by shops and shop-stages is given in Table 17.

Table 17. Summary Statement of Planned Prime Cost of Ship

(1) № п. п.	(2) Статья расхода	(3) Единица измерения	(4) Плановая себестоимость				
			(5) Корпусо- обрабаты- вающий цех	(6) Сборочно- сварочный цех	(7) Трубо- монтажный цех	(8) Дерево- обделочный цех	(9) Механо- сборочный цех
1 (18)	Материалы	(27) руб.	68 580	5 600	86 400	86 480	4 610
2 (19)	Заработная плата производственных ра- бочих	»	11 300	22 700	11 300	5 400	7 400
3 (20)	Цеховые расходы	% руб. (27)	280 31 600	200 45 500	170 19 200	180 9 700	150 11 100
(21)	Итого цеховая се- бестоимость	руб. (27)	111 480	73 800	116 900	101 580	23 110
(22)	В том числе по тех- нологическим этапам:						
1		»	90 800	—	—	—	—
2		»	20 680	—	5 400	24 200	7 900
3		»	—	31 600	5 200	26 180	7 600
4		»	—	42 200	5 600	25 700	7 610
5		»	—	—	39 100	25 500	—
6		»	—	—	48 100	—	—
7		»	—	—	13 500	—	—
8		»	—	—	—	—	—
9		»	—	—	—	—	—
4 (23)	Общезаводские рас- ходы	% руб. (27)	—	—	—	—	—
5 (24)	Контрагентские по- ставки и работы	»	—	—	—	—	—
6 (25)	Специальные и про- чие прямые расходы	»	—	—	—	—	—
(26)	Итого заводская себестоимость	руб. (27)	—	—	—	—	—

Table continued in next page

работ по цехо-этапам							
Цех делных вещей (10)	Стансельный цех (11)	Достроенно- сдаточный цех (12)	Итого цехо- вая себе- стоимость (13)	(14) Обще- заводские расходы	(15) Контр- агентские поставки и работы	(16) Специальные и прочие прямые рас- ходы	(17) Итого заводская себестоим- ость
13 460	35 850	4 600	305 580	—	—	—	—
9 850	49 000	24 200	141 150	—	—	—	—
160	130	100	160	—	—	—	—
15 700	63 700	24 200	220 700	—	—	—	—
39 010	148 550	53 000	667 430	—	—	—	667 430
—	—	—	90 800	—	—	—	—
14 700	—	—	72 880	—	—	—	—
14 510	—	—	85 090	—	—	—	—
9 800	—	—	90 910	—	—	—	—
—	46 500	—	111 100	—	—	—	—
—	52 400	—	100 500	—	—	—	—
—	49 650	—	63 150	—	—	—	—
—	—	33 200	33 200	—	—	—	—
—	—	19 800	19 800	—	—	—	—
—	—	—	—	80	—	—	—
—	—	—	—	119 500	—	—	119 500
—	—	—	—	—	416 072	—	416 072
—	—	—	—	—	—	65 198	65 198
—	—	—	667 430	119 500	416 072	65 198	1 268 200

Table 17. Summary Statement of Planned Prime Cost of Ship

Key:

1. Number in sequence
2. Expenditure item
3. Unit of measurement
4. Planned prime cost of work by shop stages
5. Hull shop
6. Assembly-welding shop
7. Pipefitting shop
8. woodworking shiop
9. Mechanical-assembly shop
10. Deck fittings sho!p
11. Building slip shop
12. Fitting-out shop
13. Total shop prime cost
14. All-plant expenditures
15. Contract agent deliveries and work
16. Special and other direct expenditures
17. Total plant prime cost
18. Materials
19. Wages paid to production workers
20. Shop expenditures
21. Total shop prime cost
22. Including by technological stages:
23. All-plant expenditures
24. Contract agent deliveries and work
25. Spexial and other direct expenditures
26. Total plant prime cost
27. Rubles (recurrs)

The possibility and the quality of planning the shop's product prime cost depends primarily on the level of technological preparation--that is, the work of the plant's technological service. It is this service which holds the "keys" to in-plant cost accounting. Unless the technological service formulating the norms of materials consumption and labor intensive norms on ship construction distributes these norms by shops and shop stages, no efforts of the planning service personnel with respect to organization of effective in-plant cost accounting will yield positive results.

Section 71. Financial Plan

The content of the financial plan. This plan concludes the formulation of the technical, industrial, and financial plan. In summary form, it reflects the results of calculations with respect to all preceeding sections of the technical, industrial, and financial plan. As a result, the financial plan shows the final financial results of the production-economic activity of the enterprise and also the level of financial resources necessary to it for normal activity in the course of a year, and sources of acquiring these resources.

Calculations making up the financial plan include:

calculation of the normative of circulating assets and determination of the sources of their formation;

determination of income and outgo;

determination of credit relationships;

establishment of the interrelationships with the higher level organization and with the state budget.

All of these calculations are summarized in the final planning document--the balance of earnings and expenditures.

The normative of circulating assets. Calculation of the normative of circulating assets is done for purposes of determining the minimum amount of financial resources necessary for the continuous operation of enterprises in the course of the planning year with account taken of specific production conditions. This calculation takes account of the circulating assets requirements not only of the basic enterprise operation but also the auxiliary and service facilities, as well as housing-utility operation and other non industrial subdivisions included in the enterprise's makeup.

The basis for calculating the circulating assets normative involves data used to draw up the estimate of outlays on production and approved norms of circulating assets for each component--production reserves, work in progress, and so on.

The normative of circulating assets with respect to production reserves is calculated for each type separately--by materials, sets of equipment, fuel, and other assets using formula (11). One day's consumption of some particular asset or other is multiplied by the established norm of circulating assets. For materials, sets of equipment, and fuel, the role of this norm is generally played by the approved norm of reserves (in days).

In the consolidated calculation of the normative of circulating assets with respect to materials we take the amount of outlays on materials with respect to the estimate of outlays on production using the weighted-average norm of reserve (about 90 to 95 days). If we use the data of the estimate of outlays on production given in Table 16 ($4,950 + 490 = 5,440$, items 1, 2) the normative of circulating assets with respect to materials will be:

$$N_o^m = \frac{5,440}{365} \cdot 90 = 1.341 \text{ million rubles.}$$

The same method is used to establish the normative of circulating assets with respect to other types of production stock: sets of equipment (weighted-average norm of reserve approximately 65 to 70 days), fuel (norm of reserve about 50 days); low-cost and fast-wearing objects (norm of circulating assets approximately 100 to 120 rubles per worker among industrial-production personnel), and so on.

The normative of circulating assets with respect to work in progress in ship building is established by the direct method: to the actual (expected) prime cost of the remaining work in progress as of the beginning of the planning year we add algebraically the change in the prime cost of the remaining work in progress for the planning year (as of the end of the year) in accordance with data of the estimate of outlays on production. For example, according to data in Table 16, the change in the prime cost of the remaining work in progress is +2.8 million rubles (item 14). If the actual prime cost of the remaining work in progress as of the beginning of the planning year is assumed to be equal to 3.84 million rubles, then the normative of circulating assets N_o^n with respect to work in progress will be:

$$N_o^n = 3,840 + 2,800 = 6.64 \text{ million rubles.}$$

The financial division of the plan combines the normatives of circulating assets established for the individual components and determines the total normative of circulating assets of the enterprise for the planning year.

After calculating the normative of circulating assets we determine the sources of their formation. Such sources of circulating assets of an enterprise comprise primarily the following:

the plant's own circulating assets attached to the enterprise in accordance with the plan of the year preceeding the planning year;

assets equated to the plant's own circulating assets--so called fixed liabilities.

To the enterprise's assets equated with its own circulating assets we assign financial assets that are possibly in circulation but which represent the enterprise's periodically recurring indebtedness. Such recurring indebtedness forms as follows:

on issuance of wages to workers and employees (wages for June, for example, are paid between 5 and 8 July);

on deductions for social security, because they are transferred to the social security budget not after the end of the month but during the wage payment periods;

other fixed liabilities (debts).

In ship building, a most important source of formation of circulating assets is the fixed liability in the form of permanent creditor indebtedness to clients with respect to payments received as the technical readiness of the ships advances. These payment, as a rule, meet the plant's circulating assets requirements within the normative of circulating assets for work in progress with respect to ships under construction, which on the average constitutes about 75 percent of all its circulating assets. Calculation of the amount of fixed liabilities with respect to client payments for partial readiness of ships P_u is made with account taken of the planned commercial output and the volume of product sales in accordance with the following formula:

$$P_u = P_z + V_t - P_r \text{ rubles,} \quad (53)$$

where P_z is the amount of client payments for partial readiness of ships as of the beginning of the planning year, rubles;

V_t is the commercial output for the planning year, rubles;

P_r is the volume of product sales for the planning year, rubles.

For example, in the plant's annual plan with respect to production and product sales (see Table 10) it specifies that the plant is to be build 20 ships, among which the construction of eight of these ships began in preceeding years, and the plant as of the beginning of the planning year already received client payments for partial readiness in the amount of 3.536 million rubles (P_z). If in accordance with Table 10 we assume the commercial output $V_t=20.63$ million rubles and the sale volume for the planning year $P_r=18.85$ million rubles, then

$$P_u = 3,536 + 20,630 - 18,850 = 5.316 \text{ million rubles.}$$

The planning of circulating assets concludes as follows: the calculated amount of their normative is compared with the actual assets from existing sources--the plant's own assets and circulating assets equated with them.

The amount of this normative, depending on the specific production conditions and tasks for the planning year, can be greater or smaller than the circulating assets which the enterprise has from all the above indicated sources. If the established normative of circulating assets exceeds the amount of assets from existing sources, then the enterprise's financial plan calls for replenishing the circulating assets; if, however, the normative is less than the existing assets, then they are to be withdrawn.

Replenishment of the normative of circulating assets, as a rule, is accomplished from the plant's own sources, primarily its profit. In ship building, when there are considerable fluctuations in the value of the volume of goods sold and profit for two years in a row, replenishment of circulating assets of the plant is accomplished also from ministry-internal redistribution of assets or from appropriations from the state budget.

Surplus enterprise circulating assets are used primarily by the higher level organization for redistribution of assets among enterprises within the Ministry, and the undistributed portion of the surplus circulating assets is deducted into the state budget.

Income and expenditures. The main source of an enterprise's income is earnings from product sales, and its expenditures go mostly into outlays for manufacturing the product. In normal operations, an enterprise's income from product sales must obligatorily exceed its expenditures on the manufacturing of the product. As a result of this the enterprise earns a net income, which is taken account of in the balance of income and expenditures in the form of profit from product sales. On the basis of profit from product sales, indicated in the estimate of outlays on production (see Table 16), the financial division establishes the balance profit: to the profit from product sales it adds algebraically the value of the results of the business activity of the non industrial operations of the enterprise (profit or loss) as well as profit (loss) from operations outside of sales (the sale of packing, shipping of materials elsewhere, and so on). The amount of profit (loss) of non industrial operations is determined by calculation, while profit (loss) from operations outside of sales is determined in most cases by experimental-statistical data.

In addition to the balance profit, an enterprise also has a number of other internal sources of acquiring assets which must be taken account of in the financial plan. Chief among these sources are amortization deductions, the amount of which is taken from the estimate of outlays on production, and also deductions from the product prime cost for scientific-research work, the acquisition of new equipment, payment of bonuses for the development and mastery of new equipment, cadre training, and so on. In planning procedure, these deductions are included in the product prime cost; a portion of them is placed at the disposal of the enterprise while another portion is given to the higher level organization. The amount of the portion of deductions from the product prime cost which remains with the enterprise is determined by the higher level organization.

Parallel to its earning of income, the enterprise during the course of a year makes numerous expenditures of financial assets for its own needs. The financial plan specifies the following basic directions of asset disbursement: the enterprise's capital investments, outlays on capital repairs, increase in the normative of the plant's own circulating assets, coverage of losses due to the operation of housing-utility facilities, deductions into the economic incentive funds and so on.* The amount of these expenditures is determined by individual calculations on the basis of estimates, approved norms and normatives, and also other objective data.*

In addition to the above indicated basic sources of the plant's own income and directions of expenditures, in the same section of the plan the enterprise determines its financial interrelationships with the higher level organization. These interrelationships consist of the fact that the financial plan specifies the acquisition of assets from the higher level organization or deductions by it by way of redistribution of profit, amortization deductions, and deductions from the product prime cost. The amount of the incoming and outgoing assets is established by the higher level organization.

Credit interrelationships. The normative of the plant's own circulating assets provides it with the minimum necessary assets for normal operations. However, the production-economic activity of enterprises during specific periods can deviate from the plan; outlays can increase temporarily, for example depending on seasonal conditions of operation, conditions of supply and product sales. In connection with this, during the course of a year the enterprise may have additional requirements for circulating assets. Such temporary additional requirements are met through credit advanced to the enterprises by issuing bank credit to them. Such credit assets received by the enterprises by Gosbank are known as loaned or hired circulating assets.

Credits for circulating assets are issued for a period of not more than one year, so that this kind of credit transaction is known as short term issuance of credit, and assets acquired this way are known as short term credit.

For the use of the credits, the enterprise pays the bank specific amounts-- a fixed percentage of the amount of the credit depending on its character, ranging between one and seven percent annually. In the event of default on paying back the credit the interest rate is increased.

For example, the interest rate for credit for accounts with product suppliers

The procedure of deductions into the economic incentive funds is outlined in Section 39.

Norms and normatives of material and labor outlays are outlined in Section 52.

is fixed in the amount of two percent annually; the total credit is 100,000 rubles; the term of credit repayment is three months after it is received. If the credit is paid back during the established period, the enterprise pays Gosbank the amount of two percent annually, which will equal:

$$\frac{\frac{100,000}{12} \cdot 3}{100} \cdot 2 = 500 \text{ rubles.}$$

In this calculation, the amount of the credit is divided by 12 and multiplied by three in order to get the average annual amount: credit in the amount of 100,000 rubles issued for 3 months comes to 25,000 rubles in terms of average annual measurement, and of this average annual amount the enterprise pays Gosbank two percent or 500 rubles.

Short term credits are paid back to the bank from the enterprise's circulating funds, and interest for the use of the credit is paid by the enterprise from its profit.

For example, outlays on the adoption of new equipment and improved organization of production as well as the organization and expansion of the production of consumer goods are taken care of basically through financing from the enterprise development fund. But in many cases the enterprise may have a shortage of such assets. This additional requirement for assets to be invested in fixed capital are met by the enterprise's through credit advanced by Gosbank.

Credits for fixed capital of enterprises are issued for a long term period--up to six years, in connection with which this form of credit transactions is known as long term issuance of credit, and funds acquired this way are known as long term credit. Credit for fixed capital for these purposes is issued by Gosbank provided that the measures to be carried out are paid for within six years through the additional profit that may be earned as a result.

For the use of these credits the enterprise pays Gosbank two percent annually from its profit. For failure to pay on time the interest rate increases.

Credits for outlays to adopt new equipment are paid off with funds from the production development fund. Credits for outlays to organize and expand the production of consumer goods and improve their quality are also paid off from funds from the production development fund or, if it is insufficient, from additional profit earned by the enterprise from implementing measures paid for through credits.

Capital investments in accordance with the centralized plan for the remodeling and expansion of the enterprises themselves are made from the enterprise's own funds--part of the amortization deductions and profit. Remodeling and expansion of the enterprises from state budget funds are undertaken

only with authorization from the Council of Ministers USSR. If the enterprise does not have enough of its own funds to commence remodeling and expansion work, it may get long term credit from Stroybank [all union bank for the financing of capital investments]. The term of payment of this credit is determined on the basis of outlay recovery periods.

Paying off of credit obtained for remodeling and expansion of an enterprise is done from profit and the portion of the amortization deductions that is earmarked for the full replacement of the fixed capital (except for those channeled into the production development fund). For the use of this credit within the planning period the enterprise pays Stroybank 0.5 percent annually, or 1.5 percent for late payments.

Credit transactions are an important component of an enterprise's financial activity. Determination of the amount of credits, sources used to pay them off, and the size of interest deductions for the use of them constitute a crucial section of the enterprise's financial plan.

Interrelationships with the state budget. An enterprise, which is the property of the state, has financial interrelationships with the state budget. First of all, every enterprise has financial obligations to the state in the form of payment for productive capital. In addition, the enterprise's net profit surplus is deducted into the state budget. But at the same time, individual enterprise expenditures, if they are not covered from the enterprise's funds, may be financed from the state budget. Such expenditures include the following: centralized capital investments, increase in the normative of circulating assets, maintenance of preschool child care facilities, and so on.

In an enterprise's financial plan all interrelationships with the state budget are accurately expressed monetarily on the basis of norms and regulations in effect.

The balance of income and expenditures. Results of calculations with respect to the above indicated sections of the financial plan are combined in the enterprise's final planning document--the balance of income and expenditures.

The balance of income and expenditures of an enterprise is given in simplified form in Table 18. This balance includes the results of planning calculations for all aspects of the enterprise's financial activity.

Table 18. Simplified Chart of Balance of Income and Expenditures
(Financial Plan)

(1) № п.	(2) Доходы, поступления средств, кредиты и ассиг- нования из государствен- ного бюджета	(3) Сумма, тыс. руб.	(1) № п.	(4) Расходы, отчисления средств, погашение кредитов и платежи в государственный бюджет	(3) Сумма, тыс. руб.
(5) I. Доходы и расходы, поступления и отчисления средств					
1	(6) Балансовая прибыль	2866	1	(14) Прирост норматива собственных оборотных средств	230
2	(7) Амортизационные от- числения	1520	2	(15) Централизованные ка- питальные вложения	950
3	(8) Выручка от реализа- ции выбывшего имуще- ства	—	3	(16) Затраты на капиталь- ный ремонт	700
4	(9) Средства, отчисляемые от себестоимости продук- ции (на научно-исследо- вательские работы, под- готовку кадров, премиро- вание за создание и ос- воение новой техники и др.)	180	4	(17) Убытки от эксплуата- ции жилищно-комму- нального хозяйства	—
5	(10) Поступление средств от вышестоящей органи- зации в порядке перерас- пределения прибыли, амортизационных отчи- слений и отчислений от себестоимости продукции	10	5	(18) Расходы на содержа- ние детских учреждений	90
6	(11) Средства родителей на содержание детских уч- реждений	30	6	(19) Расходы на освоение новой техники	70
7	(12) Прочие доходы и по- ступления	50	7	(20) Расходы на научно-ис- следовательские работы, подготовку кадров и др., осуществляемые за счет отчислений от себестои- мости продукции	190
			8	(21) Отчисления в фонды экономического стиму- лирования	750
			9	(22) Отчисления вышесто- ящей организации в по- рядке перераспределения амортизационных отчи- слений	70
			10	(23) Прочие расходы и от- числения	30
	(13) Итого доходов и поступлений средств	4656		(24) Итого расходов и отчислений средств	3080

Table continued in next page

(1) № п. п.	(2) Доходы, поступления средств, кредиты и ассигнования из государственного бюджета	(3) Сумма, руб. тыс. руб.	(1) № п. п.	(4) Расходы, отчисления средств, погашение кредитов и платежи в государственный бюджет	(3) Сумма, руб. тыс. руб.
(25) II. Кредитные взаимоотношения					
9	(26) Долгосрочный кредит на централизованные капитальные вложения	—	9	(29) Погашение долгосрочных кредитов	—
10	(27) Долгосрочный кредит на внедрение новой техники	70	10	(30) Плата по процентам за банковский кредит	25
	(28) Итого кредитов	70		(31) Итого погашение кредитов и процентов	25
(32) III. Взаимоотношения с государственным бюджетом					
11	(33) Ассигнования на централизованные капитальные вложения	—	11	(38) Плата за фонды	1150
12	(34) Ассигнования на содержание детских дошкольных учреждений	60	12	(39) Свободный остаток прибыли	511
13	(35) Ассигнования на прирост норматива собственных оборотных средств	—	13	(40) Прочие платежи в бюджет	20
	(36) Итого ассигнований из государственного бюджета	60		(41) Итого платежей в государственный бюджет	1681
	(37) Всего доходов, поступлений средств, кредитов и ассигнований из государственного бюджета	4786		(42) Всего расходов, отчислений средств, погашений кредитов и платежей в государственный бюджет	4786

Key:

1. Number in sequence
2. Income, earnings, credits, and appropriations from the state budget
3. Total, thousands of rubles
4. Expenditures, deductions, liquidation of credits, and payments into the state budget
5. I. Income and expenditures, earnings, and deductions
6. Balance profit
7. Amortization deductions
8. Earnings from the sale of withdrawn property
9. Funds deducted from the product prime cost (for scientific-research work, cadre training, bonus payments for the development and mastery of new equipment, and so on)
10. Income from the higher level organization by way of redistribution of profit, amortization deductions, and deductions from the product prime cost
11. Parents' payments to maintain child care facilities
12. Other income and earnings
13. Total income and earnings
14. Increase in the normative of the enterprise's fixed assets
15. Centralized capital investments
16. Outlays on capital repairs
17. Losses from the operation of housing-utility facilities
18. Expenditures on the maintenance of child care facilities
19. Expenditures on the adoption of new equipment
20. Expenditures on scientific-research work, cadre training, and so on, carried out by means of deductions from the product prime cost
21. Deductions into the economic incentive funds
22. Deductions of the higher level organization by way of redistribution of amortization deductions
23. Other expenditures and deductions
24. Total expenditures and deductions
25. II. Credit Interrelationships
26. Long term credit for centralized capital investments
27. Long term credit for the adoption of new equipment
28. Total credits
29. Liquidation of long term credits
30. Interest payment for bank credit
31. Total liquidation of credits and interest
32. III. Interrelationships with state budget
33. Appropriations for centralized capital investments
34. Appropriations for the maintenance of preschool child care facilities
35. Appropriations for the increase in the normative of the enterprise's own circulating assets
36. Total appropriations from the state budget
37. Total income, earnings, credits, and appropriations from the state budget
38. Payment for funds
39. Net profit surplus
40. Other payments into the budget
41. Total payments into the state budget
42. Total expenditures, deductions, liquidation of credits, and payments into the state budget

Take, for example, the balance profit of an enterprise and the example of its use given in Section 32 and observe how it is reflected in the balance of income and expenditures.

The balance profit is a basic source of enterprise income, and the size of it is given in the very beginning of the income portion of the balance--2.866 million rubles. This profit is used first of all to pay for funds --1.15 million rubles (part III of the balance) and then interest payment for bank credit--25,000 rubles (part II of the balance), deductions into the economic incentive fund--750,000 rubles, increase in the normative of the enterprise's own circulating assets--230,000 rubles, and financing of the centralized capital investments (that portion which is not covered by amortization deductions)--200,000 rubles (part I of the balance). The remaining portion of the balance profit of 511,000 rubles is considered a net surplus and is indicated in part III of the balance as a second payment into the state budget.

Let us examine another example of how the balance of income and expenditures accounts for the preceeding planning calculations.

The plant's amortization deductions in the estimate of outlays for production (see Table 16) are specified in the amount of 1.52 million rubles. These funds are completely accounted for in the income portion of the balance as an actual source of many expenditures (see Table 18): 750,000 rubles go to finance centralized capital investments ($950,000 - 200,000 = 750,000$ rubles), 700,000 rubles go to capital repairs, and 70,000 rubles are transferred to the reserve fund of the higher level organization. These directions of disbursement of amortization deductions are indicated in the expenditure portion of the balance.

In the final analysis, an enterprise's income in the form of its balance profit, earnings of other sources, credits, and appropriations from the state budget (4.786 million rubles) must be equal to its expenditures, deductions, and payments--that is, income and expenditures must balance with each other.

In all, the balance of income and expenditures, which includes the results of calculations for all parts of the technical, industrial, and financial plan, in essence constitutes the enterprise's financial plan.

Section 72. Procedure of Formulating, Approving, and Changing the Technical, Industrial, and Financial Plan

The technical, industrial, and financial plan of the enterprise. The procedure of formulating and approving the enterprise's technical, industrial, and financial plan is outlined in Section 64.

The enterprise's technical, industrial, and financial plan includes about 50 individual planning documents (forms) containing numerous technical-economic calculations and indicators. In order to review them better, the basic planning indicators for all parts of the technical, industrial, and financial plan are summarized in a single summary form. The summary form of the basic indicators of the enterprise's production-economic activity consists of two parts. The first part lists the indicators approved by the higher level organization and the second lists the indicators calculated and approved by the enterprise itself.

The technical, industrial, and financial plan specifies the objectives with respect to each technical-economic indicator for the year.

Within the course of a year these objectives are not to be changed--that is, the plan must remain stable. During the period, however, the actual circumstance may require in specific instances a change in the plan with respect to one or several parts of it. The higher level organization changes approved indicators only in exceptional cases, after preliminary discussion with the enterprise's administration. Moreover, the changes must be introduced into all the interconnected indicators of the plan. For example, if the plan with respect to the delivery of ships is reduced because of the lack of the necessary deliveries of sets of equipment, then the following must also be reduced accordingly: the commercial product, the volume of product sales, the balance profit and profitability (with respect to the funds).

Changes in the enterprises' planning indicators can be done not just at any time but only within dates specified by the Council of Ministers USSR. Quarterly and monthly plans can be changed not later than 20 days before the end of the quarter or month in question. If changes apply only to monthly plans without any change in the quarterly plan, then the enterprise director has the right himself to change the plan, but not later than 20 days before the end of the month. The director must inform the higher level organization about any change.

Guided by the technical, industrial, and financial plan, the enterprise itself draws up a revised quarterly plan, detailed by months. This plan is approved by the enterprise director and is submitted to the higher level organization one month before the beginning of the quarter. There the plan is verified for compliance with the annual plan, for the recording of the changes introduced by the organization, for the correctness of the distribution of quarterly volumes of work by months, and so on. The higher level organization is to inform the enterprise that it complies with the quarterly plan or that it is necessary to change it not later than 15 days before the beginning of the planning quarter.

In formulating quarterly plans, it is obligatory to comply with the following condition: the total of the monthly plans must yield the quarterly plan, and the total of the quarterly plans must yield the annual plan. Goods that

are not delivered during the preceeding period, as a rule, are not included again in the plan for the upcoming quarter. This output must be accomplished above the plan during the first month of the planning quarter.

For purposes of strengthening planning discipline and control over it the enterprises are obliged to inform local statistical agencies of the established plans with respect to all indicators prior to the beginning of the planning year and quarter.

In-plant technical-economic plans. Technical-economic plans are formulated for a year, broken down by quarters. Similarly to an enterprise's technical, industrial, and financial plan, a shop's technical-economic plan has a summary section which generalizes the basic indicators of the shop's activity with respect to individual directions of its work: goods production and increase production effectiveness, labor and wages, product prime cost, and so on. The approximate content of such a summary section of the technical-economic plan of a shop is given in Table 19.

Table 19. Summary Section of Basic Indicators of a Shop's Technical-Economic Plan

(1) № п. п.	(2) Показатели	(3) Единица измерения	(4) Отчет за прошлый год	(5) План на текущий год				(8) План к отчету прошлого года, %
			Всего	В том числе по кварталам				
				I	II	III	IV	
(9) I. Производство продукции								
1 (10)	Валовая продукция	(39) руб. или нормо-час						
2 (11)	Товарная продукция	(40) руб.						
3 (12)	Товарный выпуск	»						
4 (13)	Производство важнейших видов продукции:							
(14)	количество сдаваемых судов	(41) шт.						
(15)	продвижение готовности по головному судну	%						
(16) II. Повышение эффективности производства								
5 (17)	Мероприятия по техническому прогрессу, включенные в техпромфинплан завода:							
(18)	количество	(41) шт.						
(19)	экономический эффект	(40) руб.						
6 (20)	Мероприятия по техническому прогрессу цехового масштаба:							
(18)	количество	(41) шт.						
(19)	экономический эффект	(40) руб.						
(21) III. Труд и заработная плата								
7 (22)	Общий фонд заработной платы	(40) руб.						
8 (23)	Численность работающих	(42) чел.						
(24)	в том числе:							
(25)	производственных рабочих	»						
(26)	вспомогательных рабочих	»						
(27)	ИТР и служащих	»						
(28)	учеников	»						
9 (29)	Производительность труда	(43) руб./чел. нормо-час						
10 (30)	Выплаты из фонда материально-го поощрения всего	(40) руб.						
(31)	В том числе за счет фонда цеха	»						
11 (32)	Средняя зарплата одного работающего, включая выплаты из фонда материального поощрения	44 руб./чел.						
(33) IV. Себестоимость продукции								
12 (34)	Себестоимость единицы товарной продукции (дается перечень)	(40) руб.						
13 (35)	Цеховые расходы	»						
(36) V. Прочие показатели								
14 (37)	Фондоотдача	(40) руб.						
15 (38)	коэффициент использования оборудования							

[Key on following page]

Key:

1. Number in sequence
2. Indicators
3. Unit of measurement
4. Report for previous year
5. Plan for current year
6. Total
7. Including by quarters
8. Plan with respect to report of previous year, percent
9. I. Goods production
10. Gross output
11. Commercial product
12. Commercial output
13. Production of most important kinds of goods:
14. Number of ships delivered
15. Advancement of readiness with respect to prototype ship
16. II. Increasing production effectiveness
17. Technical progress measures included in the plant's technical industrial, and financial plan:
18. Number
19. Economic effect
20. Technical progress measures within the shop:
21. III. Labor and wages
22. Total wage fund
23. Number of workers
24. Including:
25. Production workers
26. Auxiliary workers
27. Engineering-technical personnel and employees
28. Apprentices
29. Labor productivity
30. Payment from material incentive fund, total
31. Including from the shop fund
32. Average wages paid per worker, including payments from the material incentive fund
33. IV. Product prime cost
34. Prime cost per unit of commercial goods (list given)
35. Shop expenditures
36. V. Other indicators
37. Output-capital ratio
38. Equipment use coefficient
39. Rubles or norm-hours
40. Rubles
41. Pieces
42. Persons
43. Rubles per worker per norm-hour
worker
44. Rubles per worker

The shop's technical-economic plan for each quarter is refined and broken down by months prior to the beginning of the quarter. In contrast to the enterprise, the planning of the shop's activity with respect to goods production is accomplished by further detailing the technical-economic plan with respect to the products list of its work and dates of fulfillment. To do this, before the beginning of each month, the shop's operational technical-economic plans with respect to production are formulated. The essence of operational-production planning is outlined in the following chapter.

During the process of formulating the shop's operational technical-economic plan with respect to production it may become necessary to revise a number of other technical-economic indicators of the shop for that month, primarily the labor indicators. This kind of corrective action of the individual directive indicators of the shops for the next month is carried out by the plant administration divisions together with the shops prior to the beginning of the planning month and approved by the enterprise director.

Production sections receive the planning target only for the following quarter, broken down by months, with subsequent monthly revision of all indicators.

Changes in the monthly technical-economic plans of shops and sections are made only exceptionally and only by the enterprise director and the chiefs of the shops, respectively. The deadline for changing a shop's technical-economic plan is the 15th of the month; for a section it is the 20th. Correction of the technical-economic plan later than the established date is not allowed.

CHAPTER XVII. PRINCIPLES OF THE ACCOUNTING AND ANALYSIS OF PRODUCTION-ECONOMIC ACTIVITY

Section 79. Organization of Accounting in an Enterprise

The importance of accounting. In Chapter 8 we outlined the basic postulates on cost accounting, indicating that one of the basic components of it is the accounting of quantitative and qualitative indicators of an enterprise's work. And indeed, the implementation of cost accounting is impossible without proper organization of accounting. After all, cost accounting is a method of planning management of a socialist enterprise and its subdivisions. However, it is possible to systematically manage production and rationally organize its daily activity only if the management and the entire collective have reliable information about the progress of the production, the actual results of plan fulfillment with respect to all indicators, and possible reasons for discrepancies. Obtaining this information is insured by a special system of accounting.

The great significance of accounting in the matter of systematic administration of production was repeatedly stressed by V.I. Lenin who said that "socialism means accounting," and that "accounting and control constitute the main requirements for the correct functioning of the first phase of a communist society" (V.I. Lenin "Works" Volume 25, page 444).

Accounting data constitutes the basis for evaluating the production-economic activity of cost-accounting enterprises and their subdivisions. These data are analyzed and serve as the basis for taking the necessary steps to utilize existing reserves and improve production effectiveness.

Types of accounting. In industry use is made of three types of accounting: operational, bookkeeping, and statistical.

Operational accounting represents a direct and physical accounting of the fulfillment of a plan in the process of production itself, directly at the work places. This accounting is accomplished for specific control over the work of the individual production links and operational influence on it. For

example, operational accounting is used to control for fulfillment of shift and daily targets by individual workers, crews, and production sections, to exercise control over the course of dock testing of ships, control over the status of supplying welding and installation operations with parts, assemblies, and sets of items, and so on. Everyday tabular accounting of the output and the accounting of norm fulfillment also constitute examples of operational accounting.

Bookkeeping accounting is the continuous and uninterrupted accounting of all enterprise assets and transactions made with them in terms of money. Data from bookkeeping accounting are used to exercise control over the fulfillment of all the plans' cost indicators; they are used to analyze them, to find production reserves, to exercise control over the financial condition, the safeguarding of socialist property, and all other aspects of the cost-accounting activity of enterprises and their subdivisions. The enterprise's receipt of materials and sets of items, issuance of these to the shops, shipping and sale of finished goods, the payment of wages to workers, and numerous other similar transactions are all objects of bookkeeping accounting.

Statistical accounting represents the selective accounting of the basic technical-economic indicators using data from operational and bookkeeping accounting (the volume of goods in physical and cost terms, the average number of workers, labor productivity, average wages paid per worker, and so on).

Overall management of accounting in this country is carried out by the Central Statistical Administration of the Council of Ministers USSR. The specific methodological administration of bookkeeping accounting is performed by the Ministry of Finances USSR. Administration of operational accounting is carried out by sector ministries.

Organization of the work of the enterprise's accounting service. Operational accounting is organized at the places of implementation of production and economic transactions is carried out by the subdivisions which are directly responsible for carrying out these transactions. Most of the work done in operational accounting is accomplished in the production shops and the dispatcher bureau of the enterprise's production-dispatcher division.

Bookkeeping accounting is carried out by a special subdivision--the accounting office, headed by the chief accountant of the enterprise. Administratively the chief accountant is under the enterprise director, but at the same time he serves in the function of a state controller to see to the correct disbursement of the plant's assets. In the event of illegal acts by the administration, the chief accountant is obliged to inform higher authorities about them. The chief accountant of an enterprise is appointed and released by the chief of the main production administration of the ministry on submission of the director of the enterprise.

In ship building plants, as a rule, bookkeeping accounting is carried out centrally--that is, with no shop accountants involved; this makes it possible to make extensive use of modern computer equipment.

The accounting department of a ship building plant consists of groups, the main ones being the following: materials, calculation, and production. The materials group organizes the accounting of materials and draws up reports concerning their use and availability; the calculation group accounts for wages paid to each worker; the production group keeps account of outlays for production and records on product prime cost.

The accounting division in its daily work relies on the technical aid of the plant's calculating machine post or the computer center. These subdivisions are subordinate to the plant's chief engineer, because they not only serve the accounting division but also carry out calculations for technical and planning services in the plant.

Statistical accounting is basically carried out by special workers who are members of the enterprise's planning-economic division, also workers from a number of other services. In the shops, statistical accounting is kept by economists. Data from this accounting are systematized in specific forms of statistical records, which the enterprises are obliged to submit to the higher level organization and the local statistical administration on prescribed dates, for example: the report on product plan fulfillment is to be submitted not later than the third day of the following month; the report on the labor plan fulfillment is to be submitted not later than the seventh day of the following month, and so on.

The statistical records forms, in addition to current data, contain planning levels with respect to all indicators, and some of them include report data for the corresponding periods of the preceeding year. This makes it possible to comprehensively evaluate the production-economic activity of the enterprises and to analyze it for subsequent work with respect to the planning of production and administration of production.

In-plant operational records keeping is organized in similar fashion, but only in simplified form in accordance with the list of planned indicators: the crew leader is to be report to the foreman, the foreman is to report to the section chief, the section chief is to report to the shop chief, the shop chief is to report to the enterprise director. The procedure and dates of such reporting are established by in-plant regulations and directives.

Methods of bookkeeping accounting. Bookkeeping accounting is the most complicated and all-encompassing kind of accounting in an enterprise. It includes the following components:

obligatory documentation of all business transactions;

systematic recording of these transactions according to strictly prescribed procedures;

periodic generalization of accounting data in summary form--in the enterprise's balance;

periodic verification of the accounting through inventory-taking and inspection.

Obligatory documentation of all business transactions is expressed in the fact that the only basis for bookkeeping accounting is the written authorization concerning the completion of a specific business transaction or the written confirmation of its completion: requisition for material, limit chart, order for piece work, route sheet, output report, demand for payment, and so on.

In order to assign outlays for particular objects of accounting (to which these outlays are assigned), each document indicates the object's code: items, shop or all-plant expenditures, shop, or section, and so on.

The systematic recording of business transaction in strictly-prescribed procedures is done by means of what are known as bookkeeping accounts, each of which has its own number and code. An individual account is opened for each type of business transaction. For example, one group of accounts handles business transactions with respect to the enterprise's fixed capital; another group keeps account of production reserves; a third group keeps account of outlays for production throughout the plant as a whole including individual shops, and so on. The list of the basic bookkeeping accounts is strictly systematized and has come to be known as the account plan.

In accordance with the degree of detail of the accounting objects, synthetic and analytic accounts are distinguished. Synthetic accounts handle business transactions with respect to a generalized (large) accounting object. For example, via the synthetic account "Basic Production" transactions are handled with respect to all outlays on production. However, for purposes of analysis and operational management this kind of consolidated accounting is inadequate. Detailed accounting is accomplished via analytical accounts, which reflect the same transactions but with smaller grouping, for example the analytical account "Basic Production of the Mechanical Shop," and so on. The total entries in the analytical accounts always corresponds to the totals entered in the corresponding synthetic accounts.

The business transactions reflected in the accounts differ in terms of their economic content. Some transactions change the makeup of the enterprise's assets--that is, they change the makeup of the fixed capital, production reserves, outlays on production, and other assets. These changes are accounted for in what are known as active accounts. Other transactions change the sources of the enterprise's funds--that is, they change the statutory fund, the economic incentive funds, the amortization fund, the amount of bank credit, and so on. These changes are reflected in the passive accounts.

Every bookkeeping account takes the form of a two-sided table: one side records the business transactions leading to an increase in assets and their sources; the other side records transactions which lead to reductions in them. The difference in totals for each part of the account is known as the balance (remainder).

Business transactions are recorded in bookkeeping accounts as they are completed. Moreover, every transaction is simultaneously recorded in two interconnected accounts, because such a transaction inevitably gives rise to bilateral changes in the makeup of the assets or sources of them. For example, the shipping of materials to the mechanical shop reduced the assets recorded in the synthetic account "Raw Materials and Supplies," and increases outlays on production that are recorded in the synthetic account "Basic Production" and the analytical account "Basic Production of the Mechanical Shop."

The interconnection between accounts that arises as a result of double-entry bookkeeping is known as account correspondence. This correspondence is determined by the directive governing the use of the plan of bookkeeping accounts.

The method of double-entry bookkeeping of all business transactions is one of the basic components of bookkeeping accounting. This method insures overall error-free accounting, because it requires equivalency in the totals of entries for the corresponding accounts. If such an equivalency is lacking, this indicates a technical error which must be corrected.

At the end of each month, the totals are drawn up for all the synthetic accounts: to the balance as of the beginning of the month we add the turnover for the given month and calculate the balance as of the end of the month.

Total data with respect to each synthetic account as of the first day of the month are generalized every month in the form of a bookkeeping balance. This balance reflects, in generalized cost form, the status of the enterprise's assets as of the given moment.

The bookkeeping balance also has the form of a two-sided table. The left side, known as the active side, shows the consolidated grouping of the enterprise's assets, for example, the amount of fixed and circulating assets, and monies in cash and on deposit. Data to fill out the active side of the balance are taken according to the carryover of the active accounts. The right side--the passive side--shows the same assets but indicates the sources from which they are acquired, for example: the amount of the statutory fund, the amount of credits. Data for the passive side of the balance yield the carryover balance of the passive accounts. Totals with respect to the active and passive sides of the balance must be identical in amount, because the balance presents the very same assets of the enterprise from different standpoints.

The bookkeeping balance constitutes an obligatory component in the cost-accounting activity of an enterprise. It presents in summary form data concerning the enterprise's property status, its financial situation, the degree to which it is supplied with its assets, and other data necessary to analyze its economic activity and to formulate measures to make better use of existing assets. The enterprise's balance in simplified form is shown in Table 23.

Table 23. Enterprise Balance

(1) п. п. №	(2) Актив	(3) Сумма, млн. руб.	(1) п. п. №	(4) Пассив	(3) Сумма, млн. руб.
1 (5)	Основные средства	58,9	1 (12)	Уставный фонд	104,8
2 (6)	Нормируемые оборотные средства	77,3	2 (13)	Износ основных средств (амортизационные отчисления)	13,2
3 (7)	В том числе нормативные средства на расчетном счете и в кассе	61,7	3 (14)	Прибыль	1,1
4 (8)	Денежные средства на расчетном счете и в кассе	0,4	4 (15)	Кредиты банка	16,6
5 (9)	Товары отгруженные	5,5	5 (16)	Кредиторская задолженность (долги данного предприятия за полученную им продукцию)	8,9
10 (10)	Дебиторская задолженность (долги заказчиков данного предприятия за полученную ими продукцию)	2,5			
	(11) Итого	144,6		(11) Итого	144,6

Key:

1. Number in sequence
2. Active
3. Total, millions of rubles
4. Passive
5. Fixed assets
6. Normed circulating assets
7. Including normative
8. Monetary resources on deposit and in cash
9. Shift goods
10. Accounts receivable (debts of clients of the given enterprise for goods they have received)
11. Total
12. Statutory fund
13. Wear on fixed assets (amortization deductions)

[Key continued on following page]

14. Profit
15. Bank credits
16. Accounts payable (debts of the given enterprise for goods received by it)

Documentation and methods of wage records. Accounting for wages paid to workers is one of the most crucial tasks in bookkeeping work. Possible errors in this not only distort the actual outlays but also immediately affect the material situation of the individual workers. In addition, the crucial nature and complexity of the accounting of wages is linked to the fact that its primary documentation is extremely numerous, and before it arrives in the accounting section it is handled by many workers: the job assigner, the production foreman, the worker, the inspection foreman, and others.

Primary documentation for the keeping of wage accounts differs for various forms of it: piece work wages are accounted for on the basis of work orders and route sheets, while time-based wages are accounted for in time sheet statements.

Most complicated and labor intensive is the accounting of piece work wages. Both primary documents--the work order and the route sheet--contain all the data necessary to determine the piece work wages paid to the worker or the crew: the kind and volume of the work performed, the normed time, the rate, the piece work wage due, the surname of the worker (crew leader) and his roster number. In addition to these data the primary document also has the following items necessary for figuring the wage: the number of the section (to account for the actual wage expenses for the section and the shop as a whole); the number of the order (to relate this wage to the prime cost of the product coded under the number); a notation that the work was accepted by the production foreman and the OTK [division of technical control]; and so on.

The route sheets are used in sections where batches of parts pass sequentially from the first to the last operation, for example in the hull shop, in the billet section of the pipe-fitting shop. The route sheet includes the above data for each operation, including the surnames of the workers performing each of them. The route sheet accompanies the batch of parts through to the final operation, and each operation is "closed" separately as it is completed. Work orders are used in assembly, installation, painting-insulation, and other operations. They are written up for each worker (crew).

Route sheets and work orders are written up by work assignment officers on the basis of technological-norming originals. These documents are handed to the workers (crew leaders) by the foreman before the work is begun. After the work is performed and turned over to the foreman or the OTK, payment documents are "closed" and submitted to the PRB [presumed expansion planning-distribution office], and from there they are sent at the end of each working day to the calculating machine office. In the calculating machine office

the primary documents on basic wages are processed properly, and data from them are finally recorded on the personal cards of the workers for each month. These personal cards are known as secondary documents, because they generalize uniform data extracted from the primary documents. (The same kind of division of accounting documents into primary and secondary is found in all other sections of bookkeeping accounting--that is, in the accounting of materials movement, forwarding of goods, acquisition and withdrawal of fixed capital, and so on).

Additional payments to the basic wages as well as bonus payments are formulated in special primary documents: additional payment sheets, bonus statements, and so on. After processing in the calculation machine office these additional wages and bonuses are also recorded on the personal cards of the workers for each month, and together with the basic wages, are included in the issuance statement.

Mechanization of accounting. All transactions of operational, bookkeeping and statistical accounting are quite elementary at bottom and simple to carry out. However, the total number of these transactions is extremely large, and completing them requires considerable outlays in labor. The repetitious nature of most of the accounting transactions allows them to be mechanized. Moreover, the mechanization of accounting is not just a means of boosting labor productivity in this labor-intensive work: it also provides for timely completion of accounting transactions in accordance with the demands of operational administration; it is important not only to have the necessary data concerning the course of production but also to have them by a specific time.

In most ship building plants all massive and interconnected accounting transactions and calculations are carried out centrally in the calculation machine offices or the computer centers. The calculation machine offices use keypunch and punched card machines, while the computer centers also have electronic computers which operate in integrated fashion with up to date primary accounting units (calculators and measuring devices), documentation devices, and communication devices.

Section 80. Principles of Economic Analysis

Essence of task of economic analysis. Evaluation of the results of an enterprise's production-economic activity, also its shops and sections, cannot be based only on a simple comparison of the planned versus actual amount of each indicator. In evaluating the results of activity it is necessary to know not only that the plan was or was not fulfilled for a specific period (day, 10-day period, month, quarter, or year) but also how the plan was or was not fulfilled, what errors were made and what caused them, what reserves remain unutilized. For this reason, after the end of each planning period and after the totals have been tallied, an economic analysis of the results of the work is made on the basis of the level of the basic technical-economic indicators.

Analysis in general is a method of scientific investigation by separating the object or phenomenon being studied into its component parts. Economic analysis by its very nature also represents a method of studying a definite phenomenon as a whole by separating it into component parts, but at the same time the object of analysis is the production-economic activity of an enterprise, shop, or section as a whole or else the status of affairs with respect to one of the technical-economic indicators of their work.

The economic analysis of the work of an enterprise and its subdivisions has as its task that of objectively evaluating the results of the production-economic activity, of determining the negative and the positive factors in the work, of seeking out existing reserves and quantitatively measuring their value in order to use this as a basis of mapping out and implementing measures to eliminate shortcomings and losses, to increase the effectiveness of production. Using economic analysis it is possible to resolve this task only if it is done objectively, on the basis of reliable facts, taking account of the main and cardinal factors that characterize the basic content of the work. Moreover, conclusions drawn from analysis must not be restricted just to a listing of these factors and phenomena; every conclusion must contain specific data on the basis of which it is possible to work out measures aimed at improving production effectiveness.

The basic content and methods of analytical work. Economic analysis is applied to all aspects of the production-economic activity of an enterprise and its subdivisions. An analysis is made first of all of the basic direction of the work--the fulfillment of the production program; special attention is focused on how the plan is fulfilled with respect to the products list, how the production capacities are being utilized, whether the work has proceeded smoothly, and so on. In evaluating the fulfillment of the production program it is obligatory to take account of changes in its labor-intensiveness as well. Analysis of the fulfillment of the production program is a most important component of the analytical work, because the conclusions drawn from this analysis determine the soundness of the work done in analyzing other segments of the production-economic activity. For example, without a reliable analysis of the fulfillment of the gross output plan it is impossible to begin analyzing labor productivity, capital-output ratio, the estimate of outlays on production, and so on.

After analysis of the fulfillment of the production program it is necessary to analyze the labor indicators, the product prime cost, the enterprise's financial status, fulfillment of the plan with respect to the adoption of new equipment, organizational-technical measures, and material-technical supply, and analysis of other aspects of the activity of the enterprise and its subdivisions.

Economic analysis is accomplished through the simultaneous use of various methods. Chief among them are: the comparison method and the dissection method.

The comparison method consists of comparing the actual value of a specific indicator with the planned value, with the actual value of this indicator during the preceeding period or during the corresponding period of the preceeding year, as well as with corresponding indicators of the work of other enterprises (shops or sections). For example, the actual volume of gross product of a shop in June of 1971 was 520,000 rubles as against a planned 510,000 rubles; in May of 1971 the shop's gross output was 510,000 rubles, while in June 1970 it was 490,000 rubles. The method of comparing these data yields the following preliminary conclusions:

- 1) in June of 1971 the shop over fulfilled the gross output plan, because the percentage of fulfillment of the monthly plan was

$$\frac{520,000}{510,000} \cdot 100 = 102 \text{ percent};$$

- 2) the shop is increasing the output of goods, because compared to May of 1971 the increase in gross output was equal to

$$\frac{520,000 - 510,000}{510,000} \cdot 100 = 2 \text{ percent},$$

while compared to the corresponding period of 1970 (June of 1970)

$$\frac{520,000 - 490,000}{490,000} \cdot 100 = 6.1 \text{ percent}.$$

The comparison method can be used to determine how the plan was fulfilled with respect to a specific indicator, also its dynamics compared to other periods. But it is still impossible to draw final conclusions on the basis of this method, because it makes it possible only to see the external aspect of the matter and does not answer the question as to how and what factors gave rise to the corresponding results. And yet answers to such questions are the main ones in economic analysis.

The dissection method is the main one in analytic work, because using it we can determine the basic causes of particular positive or negative changes in the work--that is, we can interpret the internal economic essence of a given phenomenon. By this method of analysis the indicators under examination are dissected into their component parts, each of them is analyzed individually and a determination is made of its influence on the indicator as a whole; the causes of this influence and the points on which they are exerted are determined. Let us examine once again the preceeding example, which has to do with the analysis of the shop's fulfillment of the plan with respect to gross output, using the dissection method. For the purpose let us take the following indicators in addition to data on the gross output: the products list of the shop's production program, the labor intensiveness of the product, and the number of working days.

The products list of the shop's production program with respect to the plan and the actual fulfillment is given in Table 24.

Table 24. Plan-Report of Shop with Respect to Gross Output and Labor-Intensiveness of Work as of and in June of 1971 (in accordance with consolidated products list)

(1) № п. п.	(2) Виды продукции	(3) Оценка единицы продукции		(6) План			(10) Отчет			(11) Выполнение плана, %	
		(4) тыс. руб.	(5) тыс. нормо-час	(7) Продвижение тех- нической готов- ности, %	(8) Валовая продукция, тыс. руб.	(9) Трудоемкость работ, тыс. нормо-час	(7) Продвижение тех- нической готов- ности, %	(8) Валовая продукция, тыс. руб.	(9) Трудоемкость работ, тыс. нормо-час	(12) Валовая продукция	(13) Трудоемкость работ
1	2	3	4	5	6	7	8	9	10	11	12
1 (14)	Суда проекта А	1000	70	30	300	21	33,0	330	23,1	110	110
2 (15)	Суда проекта Б	640	100	25	160	25	23,4	150	23,4	94	94
3 (16)	Прочие работы	—	—	—	50	1	—	40	0,8	80	80
(17)	Всего...	—	—	—	510	47	—	520	47,3	102	100,07

[Key on following page]

Key:

1. Number in sequence
2. Types of product
3. Evaluation of unit of product
4. Thousands of rubles
5. Thousands of norm-hours
6. Plan
7. Advancement of technical readiness, percent
8. Gross output, thousands of rubles
9. Labor intensiveness of work, thousands of norm hours
10. Report
11. Fulfillment of plan, percent
12. Gross output
13. Labor intensiveness of work
14. Ships of plan A
15. Ships of plan B
16. Other work
17. Total

Having dissected the fulfillment of the gross output plan of the shop in terms of individual types of goods (ships of two plans and other work), we are immediately convinced that the product list plan of operations was not fulfilled and the overall overfulfillment of the plan with respect to gross output (by two percent) was achieved by substantially over fulfilling the plan of work with respect to the ship of plan A. This non fulfillment of the plan with respect to the products list by itself constitutes a negative factor in the shop's work. By further analyzing this factor it is possible to determine why this non fulfillment occurred: whether it resulted from failure to provide the building slip shop with goods from other plant shops having to do with the ship of plan B on time, so that in order to keep its workers busy the shop was obliged to keep its workers busy working on the ship of plan A, or whether it resulted from the restructuring of the work at the initiative of the shop itself. Later we will see how this structural shift affected the actual results of the shop's work in terms of gross output. In order to pinpoint this effect it is necessary to calculate the labor intensiveness of the shop's production program (see Table 24).

Having studied the plan-report with respect to labor intensiveness of the production program, we can see clearly that ships of plan A and plan B differ in terms of "advantage" with respect to the amount of gross output per norm-hour:

- a) in building a ship of plan A, every planning norm-hour accounts for 14.3 rubles (the planned cost per unit of output of one million rubles is divided by the planned labor intensiveness per unit of output 70,000 norm-hours);
- b) in building ships of plan B the so called cost of one planned norm-hour comes to only 6.4 rubles (640,000 rubles divided by 100,000 norm-hours).

Thus, if in fulfilling the plan with respect to gross output for ships of plan A by 110 percent and ships of plan B by 94 percent the overall fulfillment of the plan is 102 percent, in the labor evaluation the situation with respect to the plan fulfillment changes substantially--it comes to only 100.07 percent. This means that in practice the plan is merely fulfilled (over fulfillment by 0.07 percent is not taken into account). Moreover, the substantial over fulfillment of the plan with respect to gross output (by two percent) has resulted from the so called products list "shift" in the composition of the actually-completed work compared with the plan. In this case, the shift was in favor of the material-intensive and "advantageous" product (ships of plan A): the plan for ships of plan A was over fulfilled by ten percent whereas for the labor-intensive and "disadvantageous" product (ships of plan B and other operations) was not fulfilled.

In this example the dissection method was used to analyze the fulfillment of the production program with respect to the make up of the work performed. The same method can be used as well to further analyze this sphere of the shop's activity, "dissecting" the fulfillment of the production program by days (how uniformly the work was performed in the course of the month), by sections (which sections were responsible for the non fulfillment of the plan and why), and so on. Let us confine ourselves in this case just to one additional example of the use of the dissection method for analyzing the production program.

Using the comparison method above we found that in June the shop increased the output compared with May of 1971 by two percent, while in comparison with the corresponding period of the previous year (June of 1970) this increase was 6.1 percent. On the basis of these data we drew a preliminary conclusion that the shop was increasing its output. Let us now check on the correctness of this preliminary conclusion, using the dissection method.

The three months being compared contained differing numbers of work days: June 1971 had 23 days, May 1971 had 21 days, and June 1970 had 22 days. Let us determine the average daily output of gross product. It was as follows:

in June of 1971

$$520 : 23 = 22,600 \text{ rubles;}$$

in May of 1971

$$510 : 21 = 24,300 \text{ rubles;}$$

in June 1970

$$490 : 22 = 22,300 \text{ rubles.}$$

Data on the average daily gross output completely refutes the preliminary conclusion that the shop increased its output in June compared with the preceeding month. Of course, formally the production volume in June is 10,000 rubles larger than in May, but this resulted from a circumstance that did not depend on the shop: the number of working days in June was 2 more than in May. In actuality, moreover, the average daily gross output in June was seven percent lower than in May:

$$\frac{22.6 - 24.3}{24.3} \cdot 100 = 7 \text{ percent.}$$

As far as the increase in the output compared to June 1970 is concerned, this was in fact confirmed, but not to the extent that had been imagined. According to the preliminary evaluation this increase was 6.1 percent, but when account is taken of the number of work days it was only 1.3 percent:

$$\frac{22.6 - 22.3}{22.3} \cdot 100 = 1.3 \text{ percent.}$$

From an analysis of the fulfillment of the production program we may draw the following conclusions:

1. The gross output plan for June 1971 was formerly fulfilled by 102 percent, but at the same time the product list plan was not fulfilled. The structural shift in favor of "advantageous" work was the basic factor which provided the fulfillment of the plan with respect to gross output by 102 percent. A calculation of the planned and actual labor intensiveness of the production program in connection with this showed that the shop's plan, measured in terms of labor, was fulfilled by only 100.07 percent.
2. Compared with May of 1971 the volume of gross output in the shop, measured in terms of the daily average, declined by 7 percent and compared with June of 1970 it increased, but only by 1.3 percent, which is clearly inadequate.
3. The evaluation of the shop's work for June of 1971 cannot be acknowledged as satisfactory.

This example of the analysis of fulfillment of the production program of the shop provides a general idea about the methods of analytical work and the sequence of carrying it out. Approximately the same pattern is used to analyze other aspects of the production-economic activity of an enterprise or its subdivisions.

Workers engaged in economic analysis. Analytical work is carried out in all subdivisions of an enterprise with respect to the sphere of their activity.

Through analysis the technical services seek out reserves of production in the field of improving the design of manufactured items and the technology of their manufacture. Workers engaged in the organization and norming of labor seek for reserves of better utilizing work time. Workers involved

in technical control analyze the causes of defective work. Material-technical supply and sales service study ways to reduce stocks of material assets, to reduce outlays involved in the obtaining of materials and the sale of the product, and so on.

Analysis of the results of the work is carried out by all-plant subdivisions and workers in plant shops: the PRB, the BTZ [expansion unknown], the technical bureau, and the section chiefs and foremen. Special care and thoroughness is used in analyzing cases of failure to fulfill the plan on the part of individual subdivisions. A great deal of work along these lines is also done by the social bureaus of economic analysis which many shops have.

A special role in analytical work in an enterprise is played by the planning-economic division and the main accounting office. It is they who determine the basic directions of analytical work during a specific period, based on the results of the plan fulfillment and upcoming tasks; they help in the organization and methods of analysis, they supply the subdivisions with the reference and factual material, they organize the analysis of the enterprise's work as a whole and check on the progress of implementation of measures deriving from such analysis.

The analytical work and the adoption of measures worked out in accordance with its results are under the day-by-day control of the enterprise director. In particular, in examining and approving the shop reports, the enterprise director focuses special attention on the analytical information attached to each report.

The director personally supervises the analytical work in drawing up the enterprise's annual report. The results of this work are laid out in explanatory notes to the forms of the annual report and are widely used in subsequent operational work aimed at improving the economic effectiveness of production. Considerable analytical work under the guidance of the director is also done during the period of drawing up the draft plan for the following year or the next five year period. During this period an analysis is made of: the status of the technology and the organization of production, including the status of in-plant specialization; the use of fixed and circulating assets; the level of labor productivity, ways of reducing the prime cost, and other aspects of production-economic activity. Data and conclusions drawn from this analysis are used both in drawing up the draft plan and during the process of implementation of the plan.

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